FOUNDRY TRADE JOURNAL

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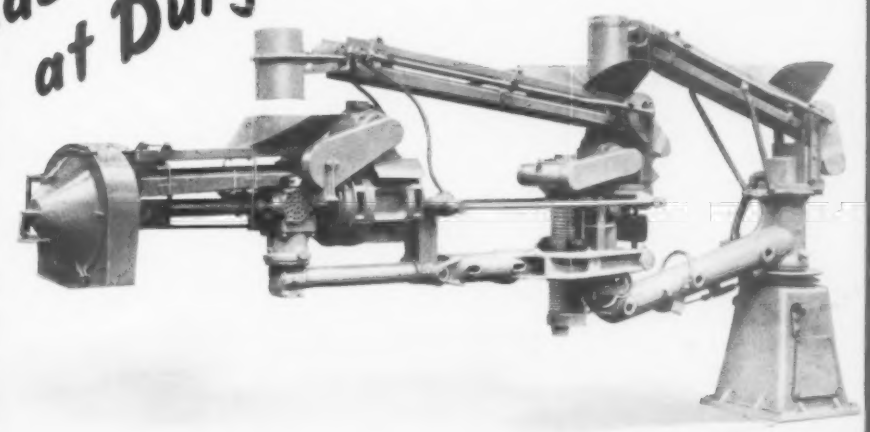
Sandslingers at Durgapur



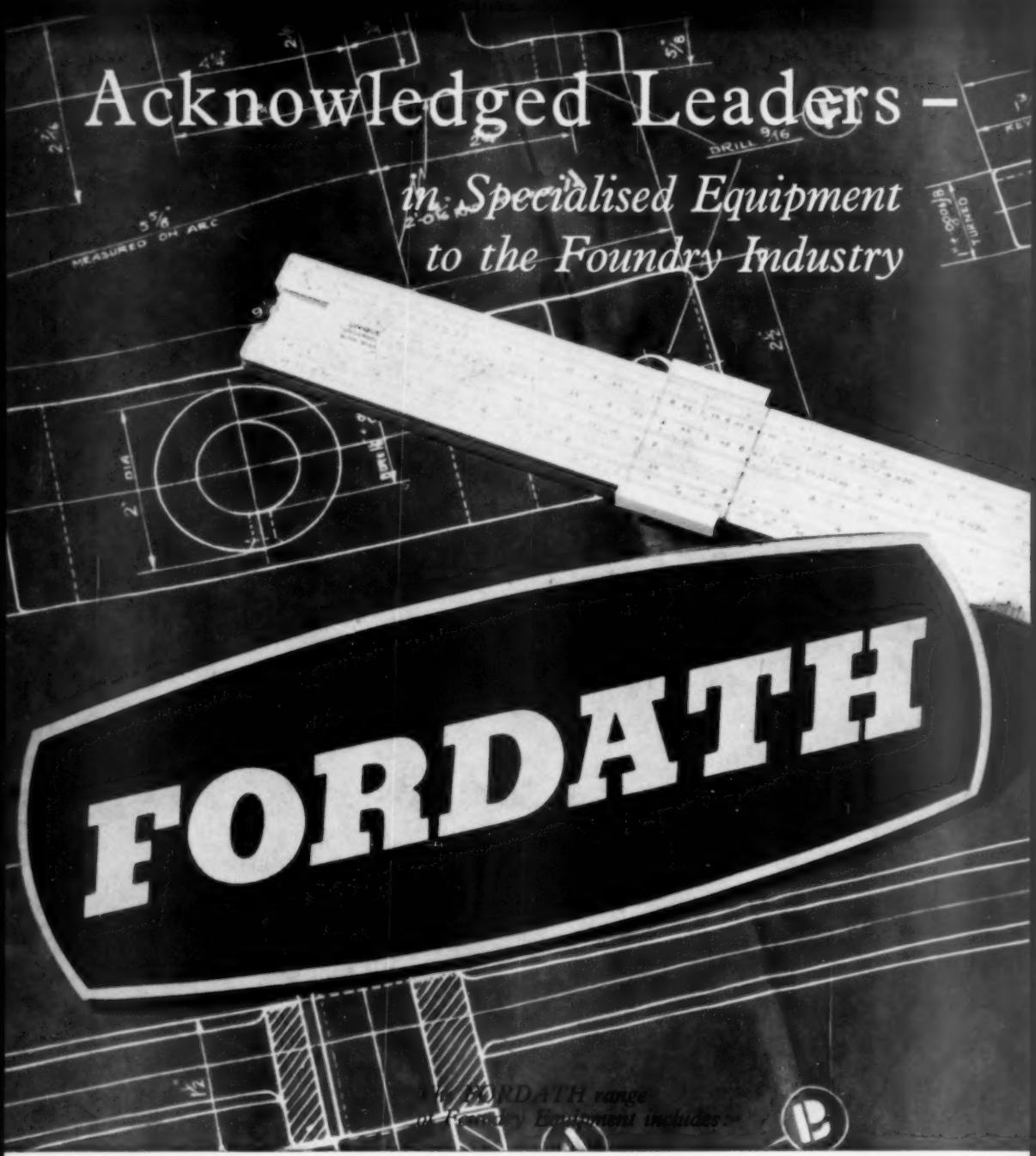
STATIONARY TYPE SANDSLINGER
with arm raising and lowering gear

Sandslinger

FOUNDRY PLANT & MACHINERY LTD
EGLINTON WORKS, COOK STREET
GLASGOW, C.5.

Acknowledged Leaders –

in Specialised Equipment to the Foundry Industry



The FORDATH range of Foundry Equipment includes:–

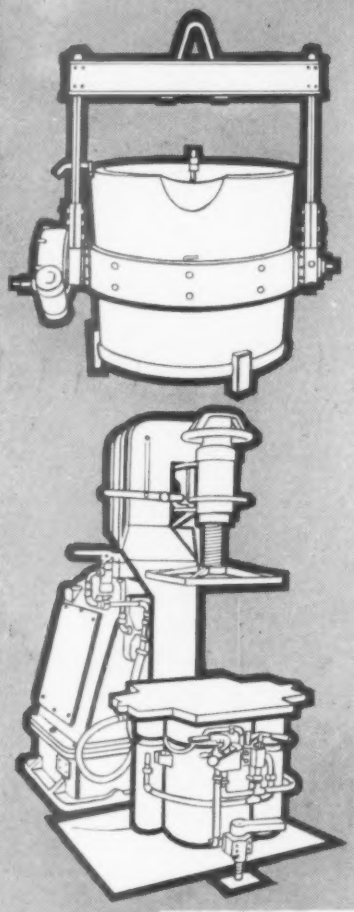
FORDATH COMPLETE SHELL SAND COATING UNITS
FORDATH SHELL MOULDING UNITS
FORDATH CORE SAND MIXERS
FORDATH CORE EXTRUSION MACHINES
FORDATH ROTARY SAND DRIERS AND COOLERS
CORALL COREBLOWING MACHINES

FORDATH

THE FORDATH ENGINEERING CO. LTD., BRANDON WAY, WEST BROMWICH STAFFS.
Telephone: WESt Bromwich 1665 (4 lines) Telegrams: Fordath Telex West Bromwich Telex No: 33415

FO234/2 *Bastable*

TWW FOUNDRY PLANT



The following Selection is available from stock subject to remaining unsold:

COLEMAN WALLWORK WT563 JOLT SQUEEZE STRAIGHT DRAW MOULDING MACHINE, 22½in. by 19in. table.

COLEMAN WALLWORK WT563C JOLT SQUEEZE STRAIGHT DRAW MOULDING MACHINE, 35in. by 24in. table.

TYPE HPL3 JOLT SQUEEZE PATTERN DRAW MOULDING MACHINE by B.M.M., table 36in. by 25in.

MACNAB ROLLOVER PATTERN DRAW MOULDING MACHINE, table 46in. by 50in.

COLEMAN WALLWORK WT562C JOLT SQUEEZE TURNOVER MOULDING MACHINES, table 35in. by 24in.

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SAND SLINGER 9ft. radius with three motors 400/3/50 by Foundry Plant & Machine Co.

LINSLADE No. 1 SAND SLINGER, 10ft. radius, by Foundry Equipment Co.

AUGUST No. 3 SAND MILL, pan 8ft. dia. by 4ft. deep, cap. 10/15 ton/hr.

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MOTOR DRIVEN CLEANING & POLISHING RUMBLING BARREL, 26in. across flats by 38in. long. Motor drive.

10 TON COLLIN GEARED CRANE LADLE.

NEW GEARED FOUNDRY CRANE LADLES (10 cwts. to 3 ton cap. in stock).

AIR COMPRESSOR, both new and secondhand —CUPOLA BLOWING FANS, DUST EXTRACTION FANS, SHOT BLAST EQUIPMENT, etc.. etc.

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PP19

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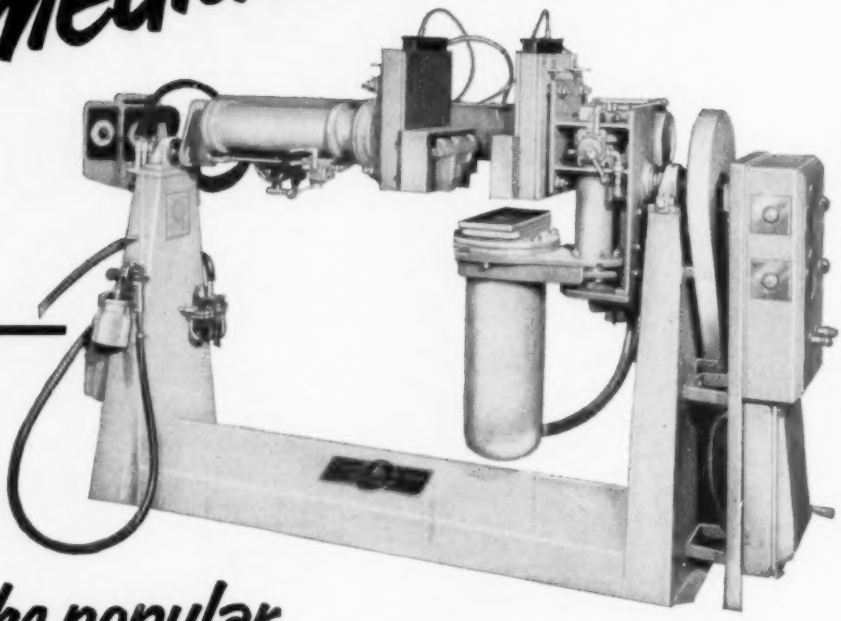

of the popular

SHALCO MCM 5

SHELL CORE BLOWER

Produces finished single or multiple cores, ready for setting in 30-50 seconds. Compact and complete in itself—no other equipment required. Investing and curing automatically controlled. Handling of hot core boxes eliminated. Any type of core can be blown in shell. Maximum box sizes accommodated: Model A 16" x 15", Model B 21" x 15".

STONE PLATT GROUP

THE COLEMAN WALLWORK FOUNDRY EQUIPMENT DIVISION OF STONE WALLWORK LIMITED

32 VICTORIA STREET, LONDON, S.W.1 Telephone: ABBey 7681

the pools

". . . and I might at that if a couple of teams I could mention were to buy themselves some decent centre forwards.

"Football is a funny game. One week a club is a world-beater and yet a few days later they can be licked to a frazzle by a team from a girls' school.

"Heaven help us if we carried on that sort of caper at AW. Customers don't want firms that are up one minute and down the next. When buyers come to a company with our reputation they expect—and get—a reliable performance. Fancy telling them that a load of pig wasn't up to specification because one of our furnacemen was off form!

"I reckon I'd get a coupon up every week if footballers were only half as consistent as the AW team."

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'Supplied to any specification at short notice'

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Steel Foundry: Western Road Works · Jarrow · Co. Durham.

A2

The *NEW* Redford No. 1A

Single Lever Operation Higher Production

The New Single Lever Redford No. 1A still retains its STRENGTH and SIMPLICITY, but reduces operational time, maintenance costs and labour fatigue. With FOUR operations in ONE production is even higher.

If you make cores up to 2 lbs. you should use a Redford. It will make them quicker and cheaper than any comparable machine on the world market today.

It has great adaptiveness and is used widely co-operating the CO_2 process and the design provides rapid action to all adjustable parts, including the pneumatic clamps.

To BRITISH RONCERAY LIMITED

Please send me further details of the Redford Core Blower/Redford Pneumatic Clamp without obligation.

Name .....

.....

Just attach to one of your letter-headings and post to-day to:—

BRITISH RONCERAY LIMITED

14, WOLSELEY ROAD, SHEFFIELD 8

***A typical Pneulec installation for . . .* wet sand storage . . . drying . . . cooling . . . conveying . . . storage . . . batch weighing . . . mixing.**

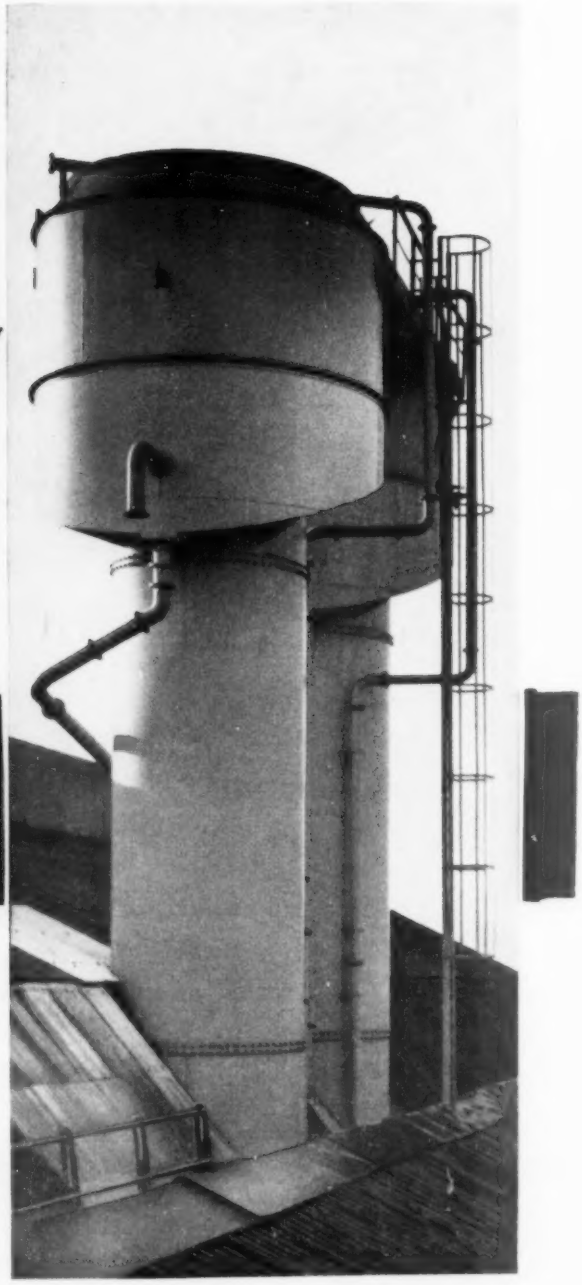
Built in England by

PNEULEC LIMITED. SMETHWICK, Nr. BIRMINGHAM

ROPER

Wet type

SPARK ARRESTERS



Designed and tailor-made to suit your particular requirements.
A simple yet scientific approach to the vital problem of dust and grit suppression.
Illustrated is a Wet Type Spark Arrester serving a 25 ton an hour Cupola plant recently installed at R.T.B. Llandore.

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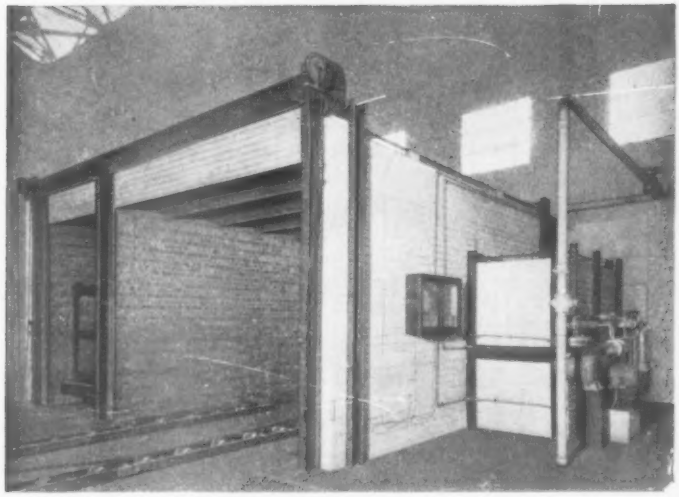
FOUNDRY EQUIPMENT ENGINEERS
KEIGHLEY YORKSHIRE

Greater all-round efficiency . . .



" NEWSTAD " Core and Mould Drying Stoves gas-fired

Photo by courtesy of Messrs. John Hill & Son (Ironfounders) Ltd. (Branch of the Staveley Group)

Economical and constant performance ensured by automatic control and full safety protection. Clean and highly efficient in operation. These stoves combine the advantages of our well-known Newstad recirculation system with full automatic temperature control, flame failure and electrical failure protection, and conform to all the requirements of the regulations governing foundry conditions. Also available " Junior " small oil-fired portable Mould Dryer, Sand Dryers, etc.

MODERN FURNACES and STOVES LIMITED

Builders of INDUSTRIAL FURNACES

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Forest Engineering (PTY) Ltd. P. O. Box 6738, Johannesburg, South Africa.

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Avoid scabbing and rat-tail defects

Cast in synthetic sand containing BERKOAL *Cast in previous synthetic sand*

REPRODUCED BY PERMISSION OF R. & A. MAIN LTD., EDMONTON WHO COLLABORATED IN THIS DEMONSTRATION

These photographs clearly show the effect a small addition of (say 2%) BERKOAL has in overcoming scabbing and rat-tail defects due to sand expansion. Ask Berk for a trial delivery and full technical data.

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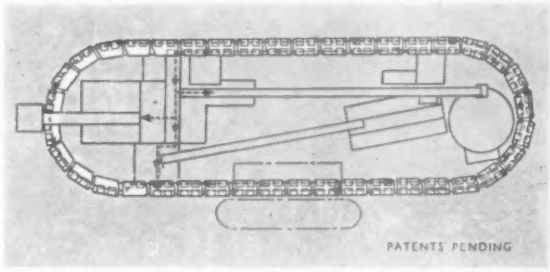
BARTLETT-SNOW
CLEVELAND 5, OHIO

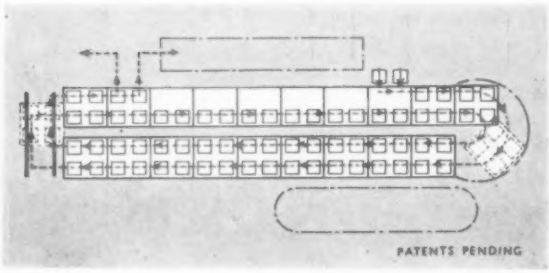
Mould Handling Systems

Unique and Practical

"Double MLC" Mould Handling System

Snap or tight flask moulds are set out in outside position on the car, poured, and travel almost completely around the loop. They are then transferred automatically to inside position on the car, and continue around the loop again for automatic removal at the shakeout. These new systems provide almost twice the cooling time of a conventional mould conveyor carrying only a single line of moulds; effecting substantial savings in floor space, equipment, building, and other facilities.



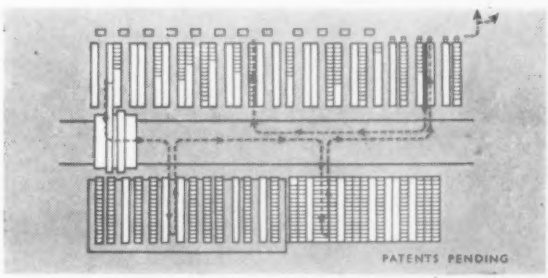


"Double MRI" Mould Handling System

Rectangular loop, consisting of two straight runs connected with a rotary turn and transfer car. Cars advance one car length, then remain stationary for timed period so large moulds can be loaded onto the conveyor, poured, and the moulds removed, while the conveyor is stationary. Moulds are carried side by side on the cars and make almost two complete trips around the loop, thus nearly doubling the cooling time per square foot of floor space.

"MF" Mould Handling System

Unlimited flexibility for jobbing foundries. The transfer car delivers pallets loaded with similar moulds, to the pouring, cooling, and shakeout zones, and returns the pallet with the bottom boards and bands—or flasks—to the moulding area. Handling similar moulds together permits moulds for different castings to be kept separate, and even poured with different metals, without interfering with other groups of castings. Slow jobs do not hold up the fast jobs. Moulding, pouring, cooling and shakeout are centralized, minimizing the equipment requirement.



Write today for a copy of Bulletin No. 135. It gives full details about eight different types of Bartlett-Snow Mould Handling Systems.

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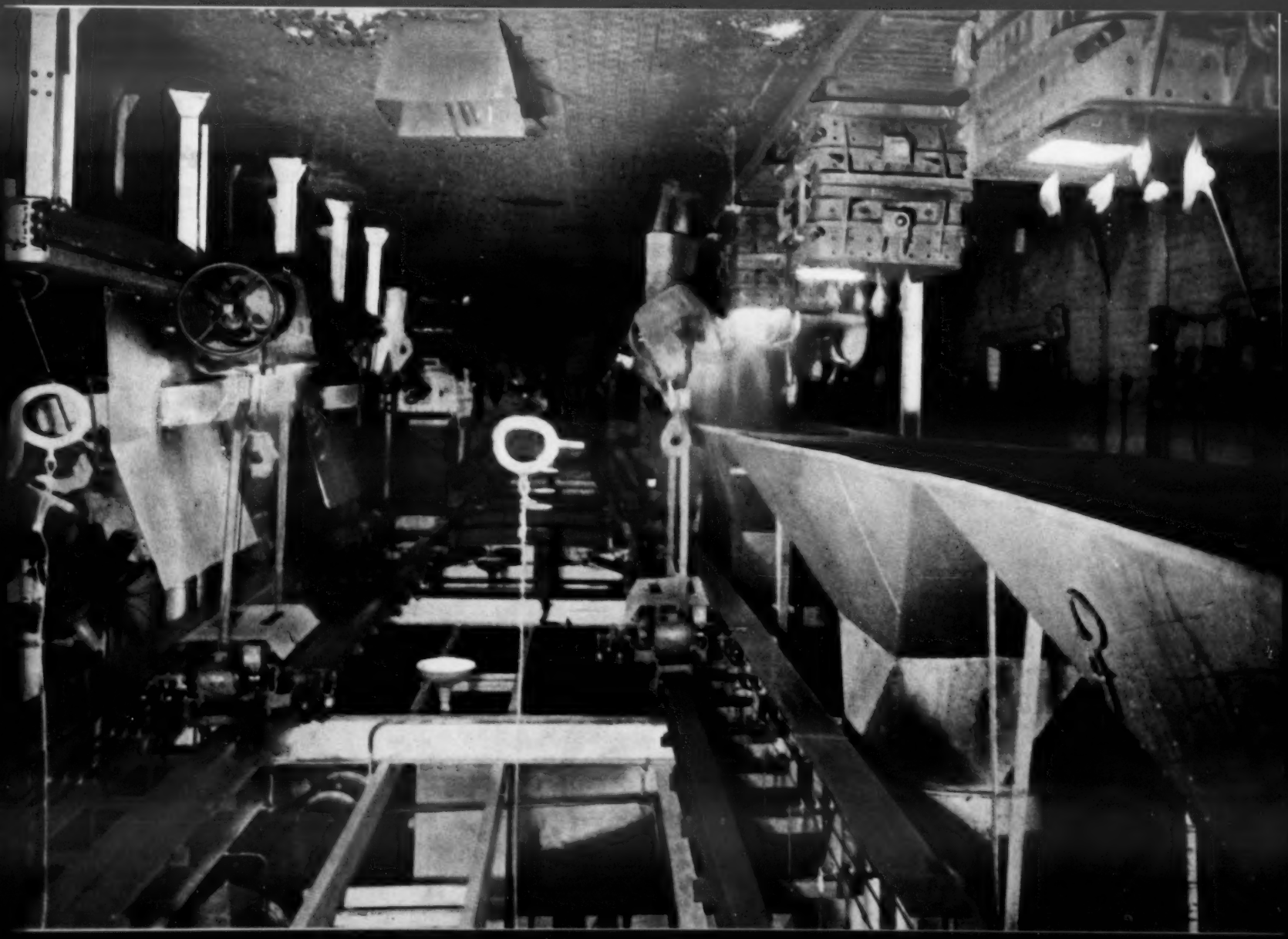
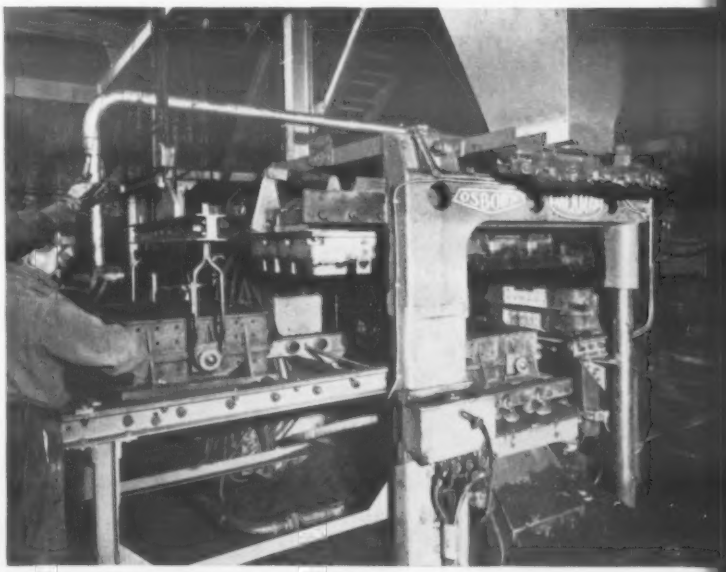
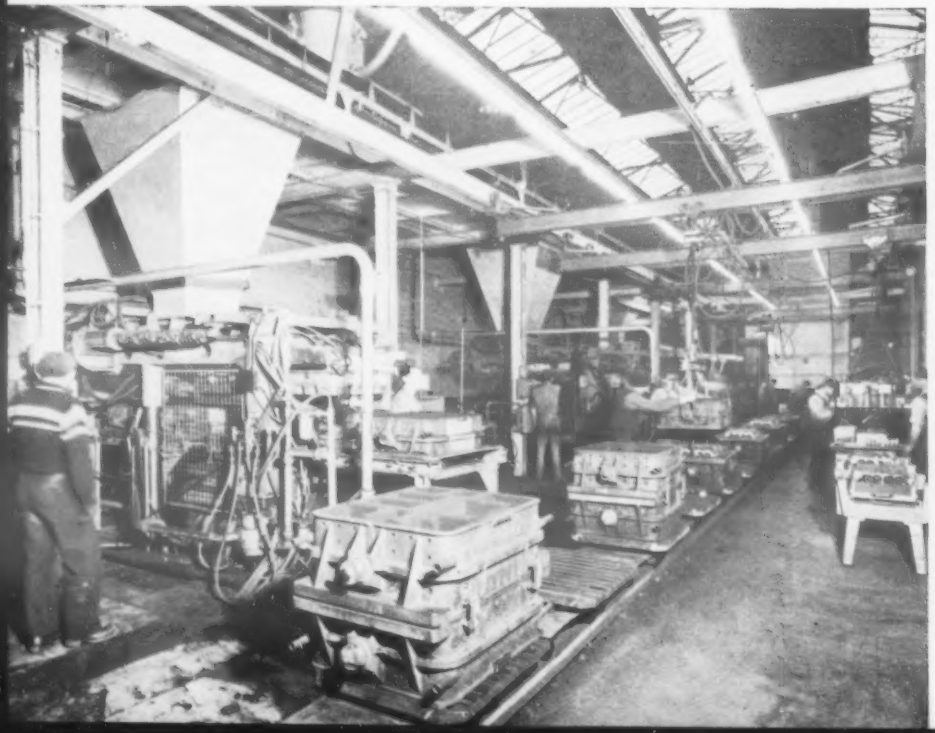


614 Cogent

Sterling boxes help to build BMC parts at Wellingborough

Sterling boxes are used in conjunction with these new semi-automatic machines recently installed at Messrs Morris Engines Foundry at Wellingborough. The machines are capable of an output of sixty complete moulds per hour, and the boxes used are of the famous Sterling heavy duty type designed to resist very high moulding pressures and stresses, and ideal for operating in mechanised foundries.





Sterling

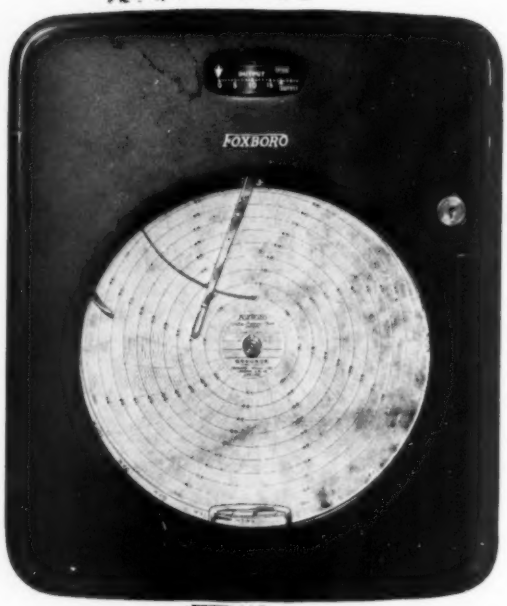
MOULDING BOXES

STERLING FOUNDRY SPECIALTIES LIMITED, BEDFORD.

FOXBORO

Foundry Instrumentation

Weigh all the air



THE FOXBORO AIR WEIGHT CONTROL SYSTEM is specially developed to provide the Foundry Industry with Uniform Cupola Control. This completely Automatic System controls the weight of Air delivered to the Cupola, reduces fuel consumption and makes possible :—

UNIFORM HEATING

BETTER POURING

HIGHER QUALITY CASTINGS

In addition, Foxboro Systems are available for measuring, recording or controlling — Pressure, Humidity, Dewpoint, Temperature and many other variables.

FOXBORO-YOXALL LIMITED

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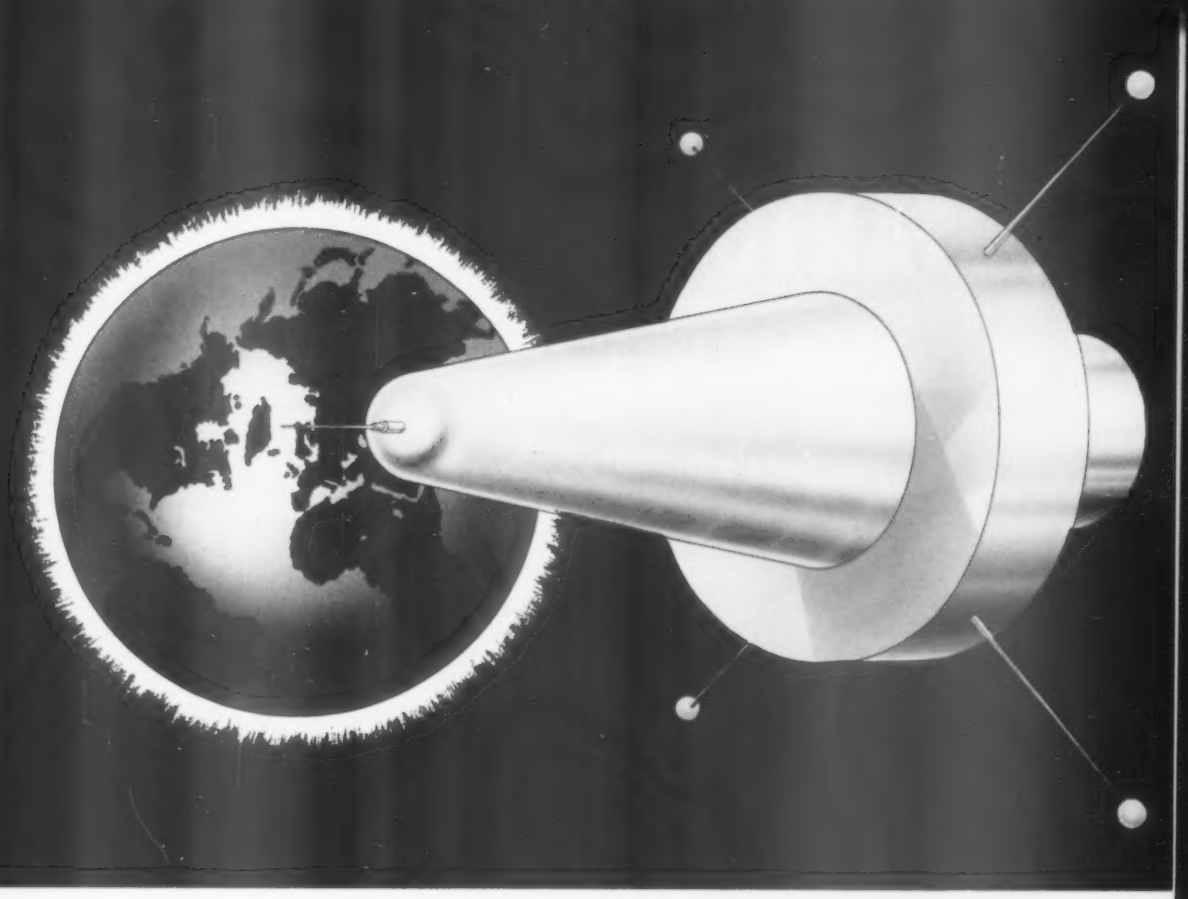

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World-wide service for foundrymen and steelmakers

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STANTON low phosphorus foundry pig iron

This iron is machine cast and customers special requirements can be met within the limits of analysis shown.

It is particularly suitable for the Automobile Industry and for all High Quality Castings.

ANALYSIS	**Total Carbon**	**3·4% min.**
	Silicon	**2·0—4·5%** (in ranges of ·5%)
	Manganese	**0·7—1·1%**
	Sulphur	**0·05% max.**
	Phosphorus	**0.25 % max.**

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A free and confidential metallurgical service is offered to customers in all aspects of foundry practice and technique.

THE STANTON IRONWORKS COMPANY LIMITED NEAR NOTTINGHAM

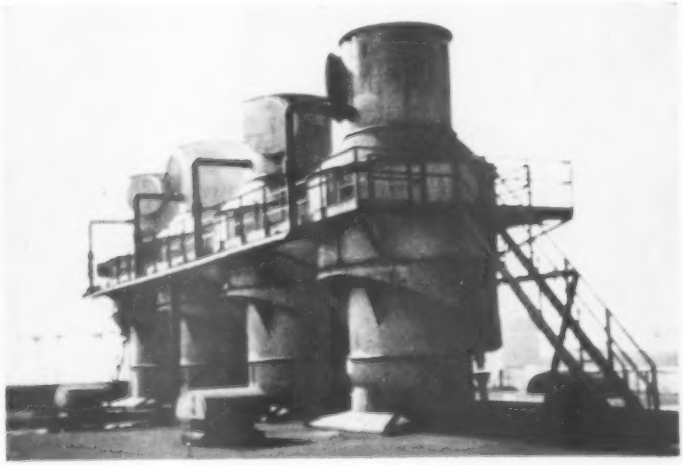
The 'CLEAN AIR ACT' demands EFFICIENT dust and grit suppression

Instal...

TITAN

WET ARRESTERS

Designed by the principal Cupola manufacturers in the U.K. with more than 40 years experience and proven practice in all aspects of Cupola operation.



Many Foundrymen think Wet Spark Arresters are a recent development and because of troubles experienced with some installations, usually caused through bad design, they tend to regard them with suspicion.

We are proud that FORD MOTOR CO. selected **TITAN** Wet Spark Arresters for the **4 TITAN** 30 ton per hour Hot Blast Cupolas which we installed in their new Thames Foundry, the most modern in Europe.

These are illustrated, the second Cupola from the left is "blowing" —note the complete absence of dark smoke, sure proof of efficiency.

Photo completely untouched taken during normal operating conditions.

CONSIDER THESE ADVANTAGES

- Reduce Maintenance or Replacement of Gutters, Drains and Roof Sheeting
- Protection of Paintwork, Roof Structures and Coatings, Glazing, etc.
- Eliminate Fire Hazards. It's worth approaching your Insurance Company!
- Improve Working Conditions in Adjacent Workshops Enamelling Plants, Offices.

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DESIGNERS & ACTUAL BUILDERS OF EFFICIENT FOUNDRY PLANT

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N°1 Standard 'FULBOND' Grades

FULBOND 4A

FULBOND 4A combines very high green strength and rapid bond development. It is not sensitive to the normal increase of moisture within the working range of moulding sands. One of its special features is that it produces easy collapsibility of the sand at the knock-out.

Practice Recommendations

For every kind of green sand practice.
For dry sand practice in medium to high clay content natural sands.
For green and dry sand practice based on natural sands where the moisture content varies.
Where milling time is short and intensive mixing cannot be given.
To reduce the danger of cracked castings, especially in malleable iron.
To increase the green strength of organically bonded core sands.

FULBOND 2

FULBOND 2 has high dry strength, good green strength and develops its bond quickly. It can be used in either green or dry sand practice in semi-synthetic and natural moulding sands.

Practice Recommendations

For green and dry sand work, especially in unit systems.
For preparing loam sand or increasing the clay content of natural loam sands.
For increasing the green strength of sodium silicate sands and adjusting the breakdown properties.
For boosting the green strength of both organic and inorganic sands.

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THE FULLERS' EARTH UNION LTD

Patteson Court, Nutfield Road, Redhill, Surrey

A member of The Laporte Group

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1. Diegrinders, 90,000 40,000, 22,000; 13,000, r.p.m.

2. Angle Grinders for Fettling and Notching.

3. Silent Drills from 400 to 18,000 r.p.m.

4. Nylon Blowguns almost indestructible.

5. Rust Brushers, 3,000r.p.m for Cup or Wheel Brushes.

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Also — Hammers and Chisels, Bench Rammers, Surface Descalers, Air Vice with safety feature, Quick Action Plugs, Sockets, Hoses and all types of accessories.

B. O. MORRIS LTD, Morrisflex Works, COVENTRY

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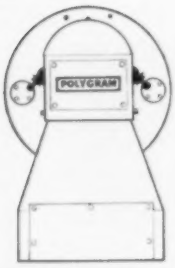
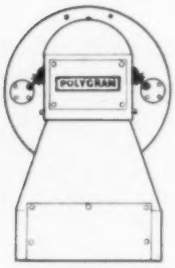
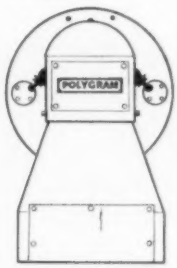


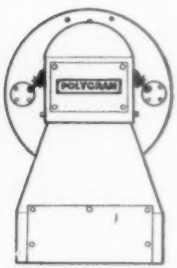
SHELL COREMAKING



SHELL MOULDING

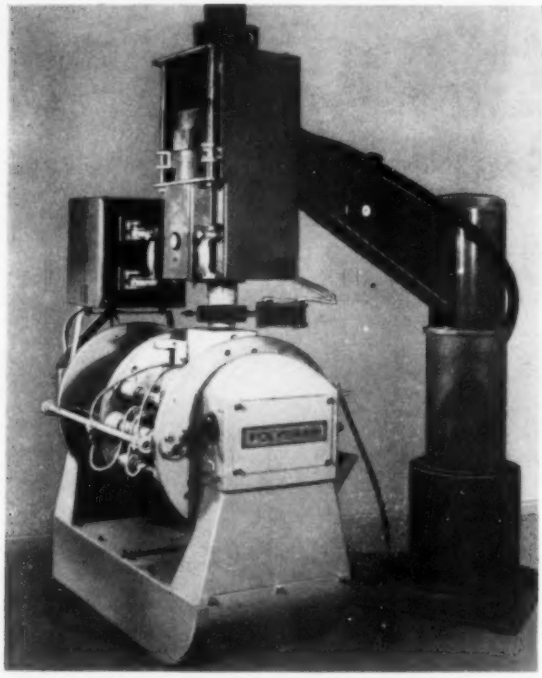


HOT-BOX PROCESS



GRAVITY DIECASTING

ONE . . . Polygram MANIPULATORS for SHELL COREMAKING



This shows a Manipulator in use with the latest Polygram column-mounted Coreblowing head.

Polygram Manipulators are the ideal method for handling large shell coreboxes (up to a maximum size of 28in. by 18in.) since they offer the following advantages:—

Full pneumatic operation from closing box to ejection of core.
Automatic control of operation if desired.
Temperature of each half of corebox electrically regulated within $\pm 5^{\circ}$C.
Can be used with existing core blowers or shooters.
Single-Station Core Blower (see above) can be built up to Six-Station Machine by adding Manipulators.

Further Details From

Polygram *Casting Company Limited*

THE FIRST NAME IN SHELL MOULDING

SHERNFOLD PARK, FRANT, TUNBRIDGE WELLS, KENT, ENGLAND.
TEL. FRANT 346

The Only British Specialists in Shell Moulding and Coremaking

MORGAN

BASIN TILTERS

*The new BT-1300 takes only 60 minutes to melt all this Aluminium Alloy

During the past eighteen months 54 Morgan Basin Tilters have been installed in modern foundries for fast and economical bulk melting of a wide range of high quality aluminium or copper based alloys.

For top quality castings and lowest melting loss, invest in the most flexible of all bulk melters. Ask for a demonstration, with your own metal if preferred, at the Battersea Test Foundry.

MORGANITE CRUCIBLE LIMITED, NORTON WORKS, WOODBURY LANE, WORCESTER. Tel: Worcester 26691 Telex: 33191

A Member of The Morgan Crucible Group.

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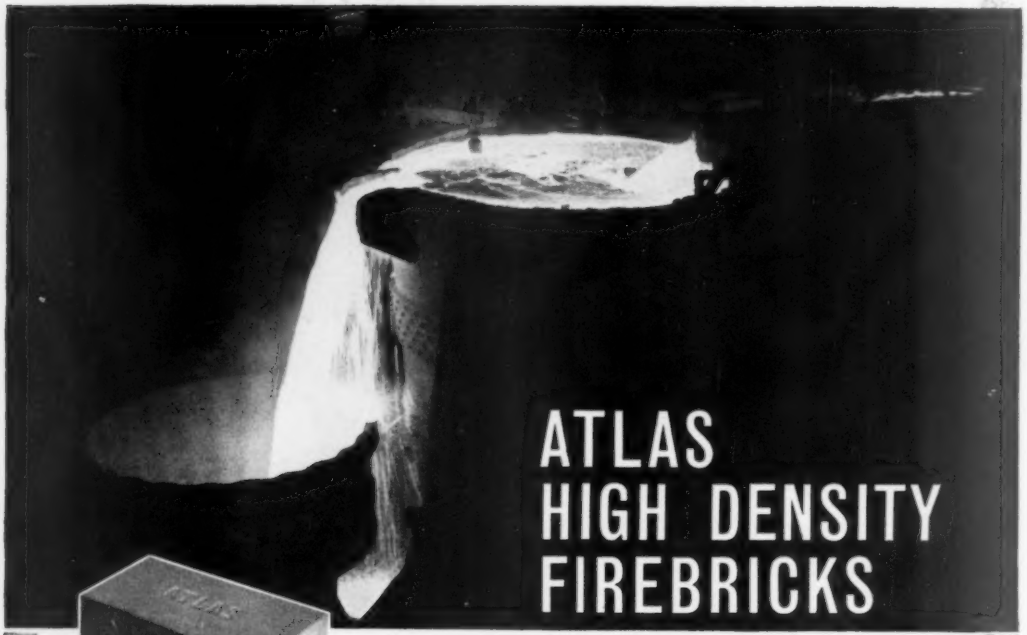

No firebrick can withstand high temperatures and heavy loads indefinitely.

But **ATLAS HIGH DENSITY** Firebricks have the maximum life possible under such conditions. They have been produced specifically for ladle linings and are quite unique in their performance in bottoms and the striking areas. High crushing strength and great resistance to penetration, erosion and abrasion have been combined to ensure a long working life.

Use **ATLAS HIGH DENSITY** Firebricks and line less often.

ILLUSTRATION

Tapping a furnace at Abbey Melting Shop, Steel Company of Wales Ltd. Ladle Bottoms are ATLAS Firebricks.

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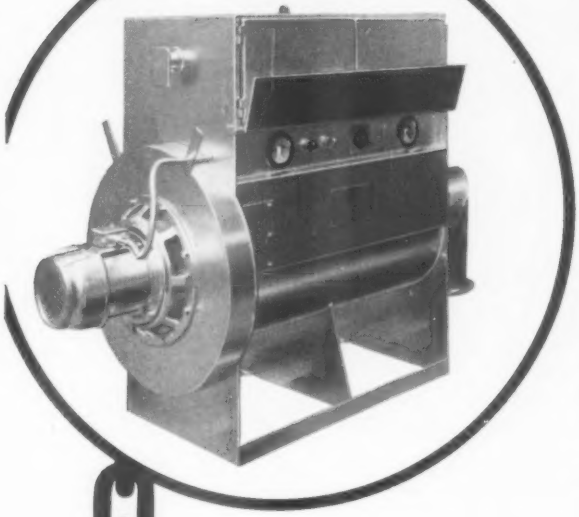

". . . designed for drying floor moulds or large box moulds for ferrous and non-ferrous metal castings. They operate by forcing hot air over the mould surface and through the sand giving quicker and more efficient drying than is normally achieved by other methods. Using air temperatures lower than hot gases, and less than one third the quantity of heat, they reduce drying times by half. Heating is uniform throughout the mould and despite rapid drying, surfaces remain free from cracks and cleaner castings are produced.

* Driers need no attention during operation.
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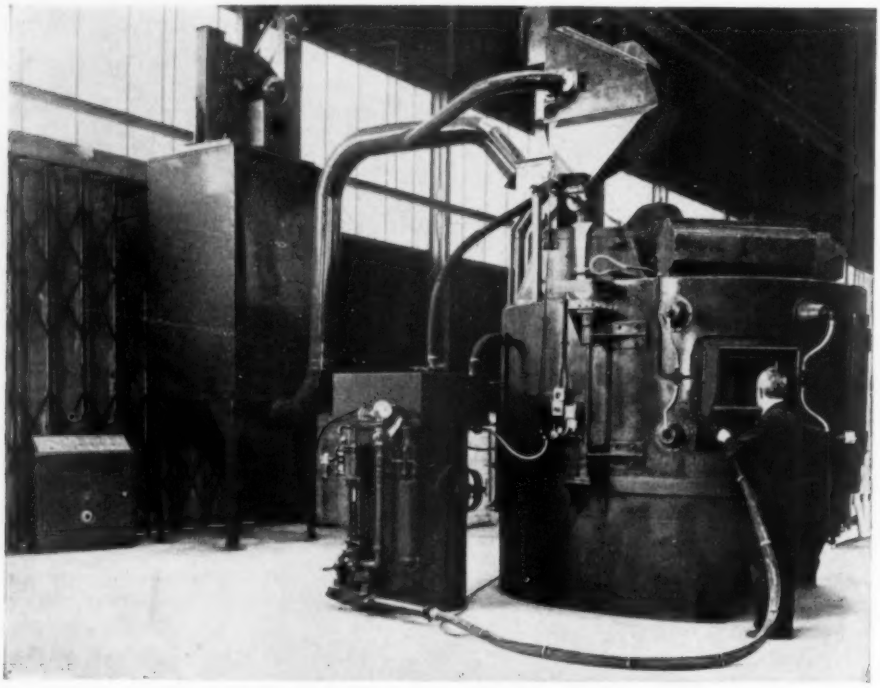

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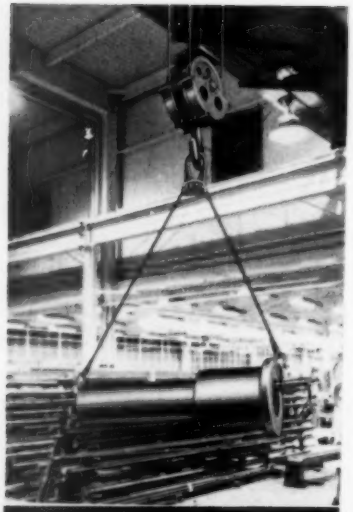

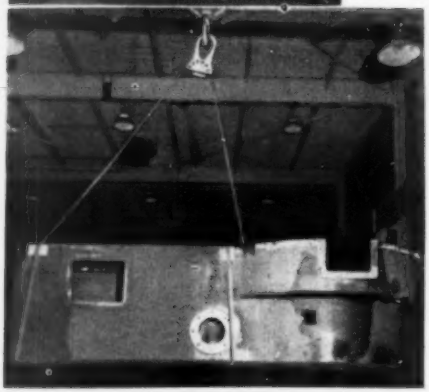

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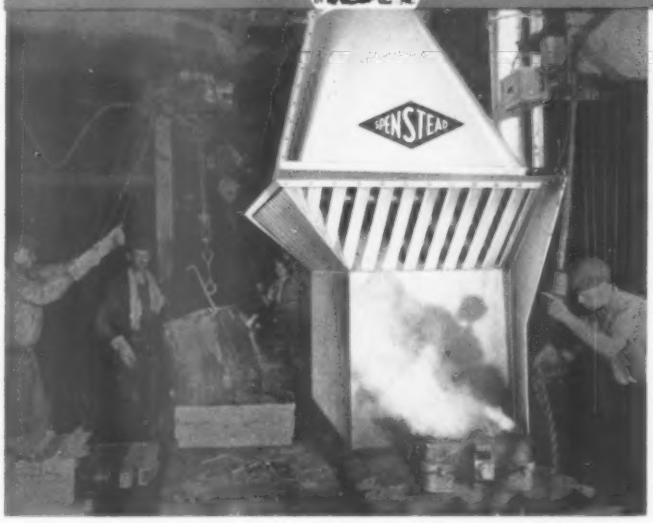

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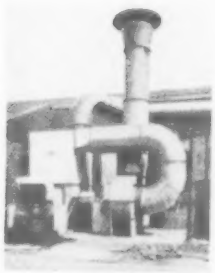

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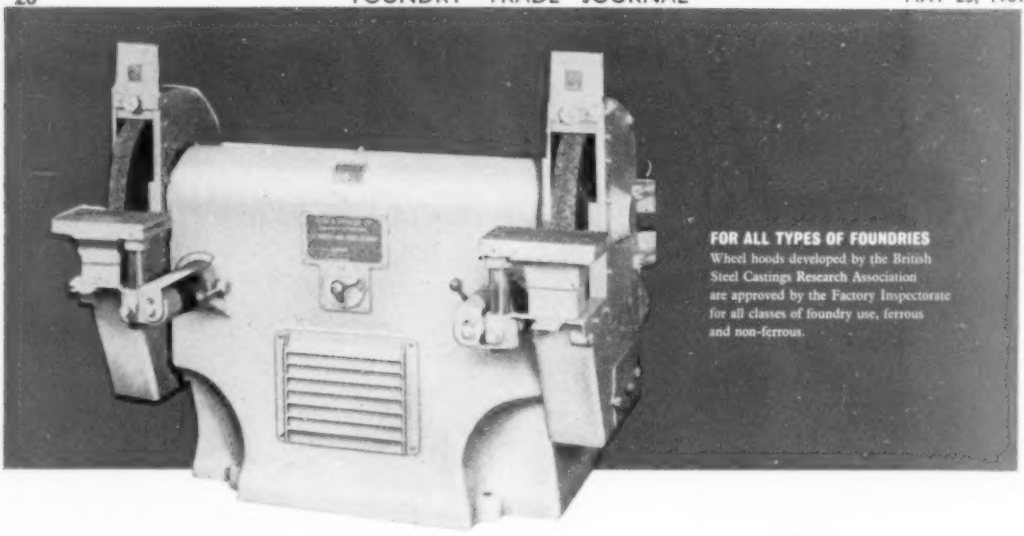

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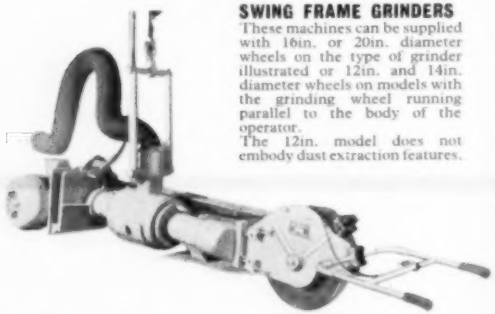

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These machines can be supplied with 16in. or 20in. diameter wheels on the type of grinder illustrated or 12in. and 14in. diameter wheels on models with the grinding wheel running parallel to the body of the operator.
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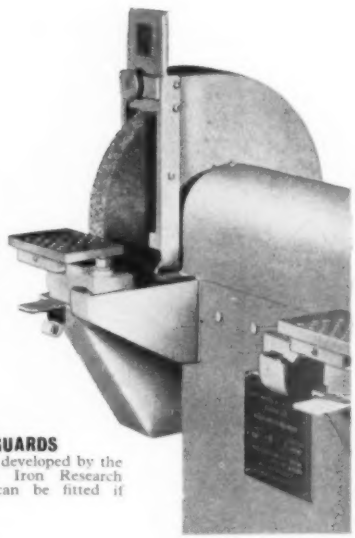

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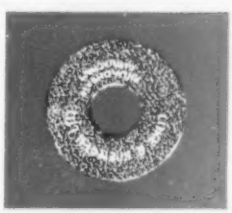

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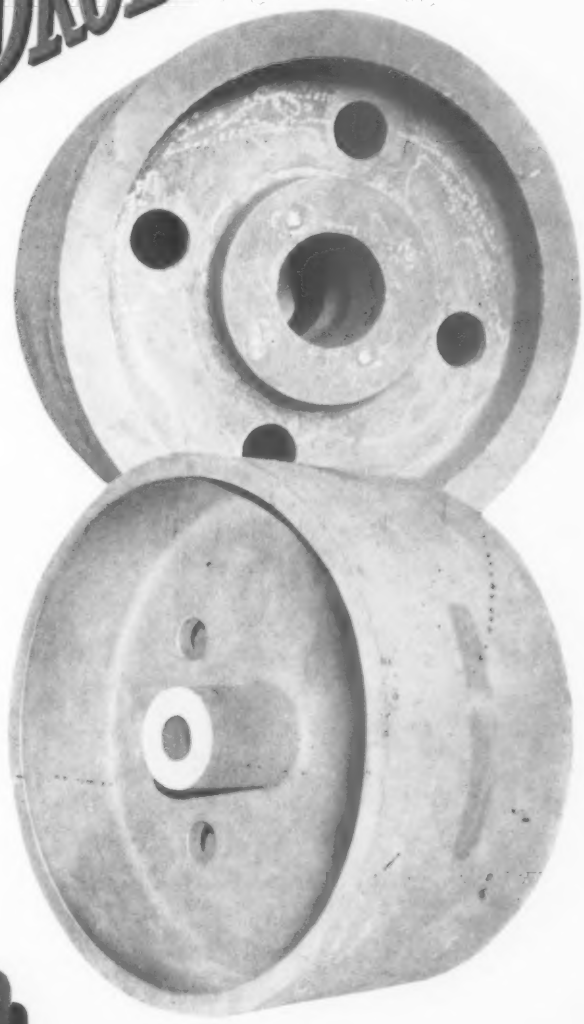
CORE OILS



To produce castings of this size calls for 'know-how', not only in the actual casting but also in the selection of the best bond for the cores.
That is why Messrs. Smith & Grace Ltd. of Thrapston, who produced the pulleys illustrated use Foundrol C31/A Core Oil.
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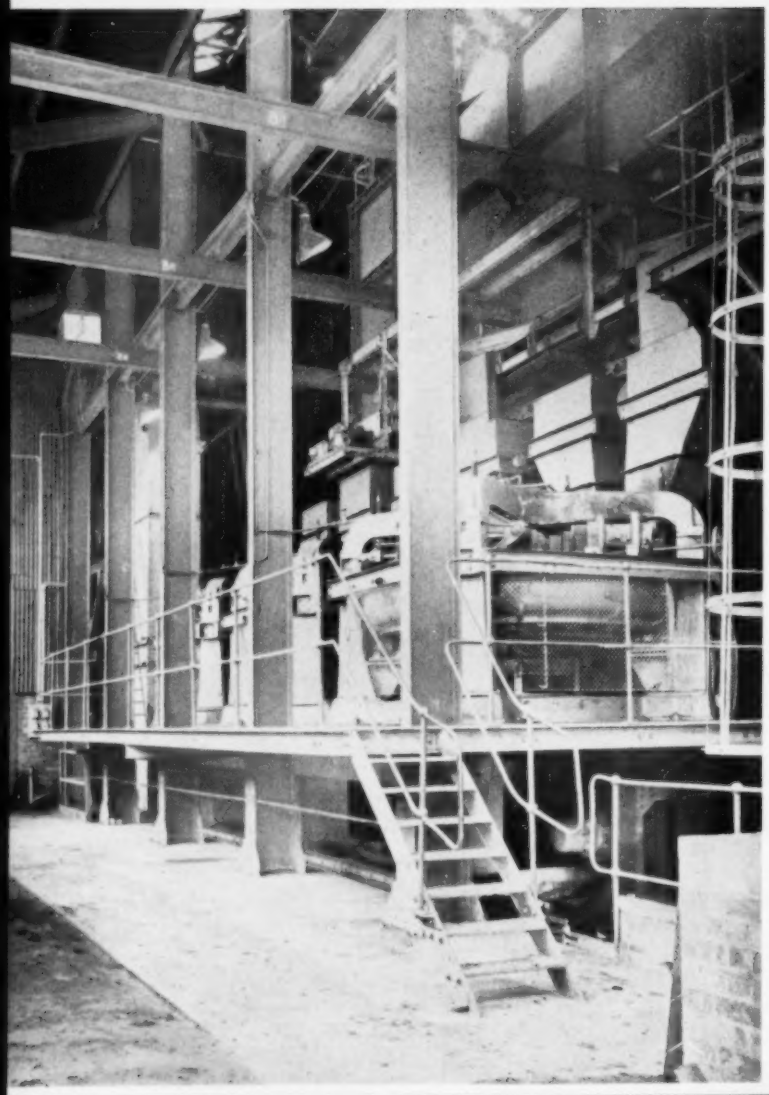

Some illustrations showing the two separate Foundry installations which we have been privileged to supply to our Clients, The Staveley Iron and Chemical Co. Ltd., Chesterfield.

(All photographs reproduced by courtesy of The Staveley Iron & Chemical Co. Ltd.)

Three S.E.J Continuous Sand Mills (90 ton per hour total output) with Storage Hoppers forming part of new Sand Conditioning and Distribution System installed in new Building to step up prepared sand requirements in the large Iron Foundry of The Staveley Iron and Chemical Co. Ltd.

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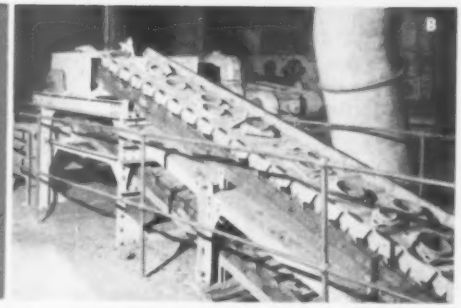
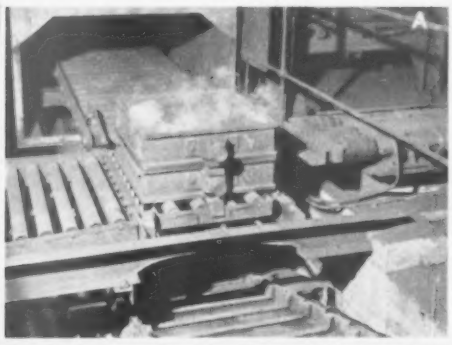
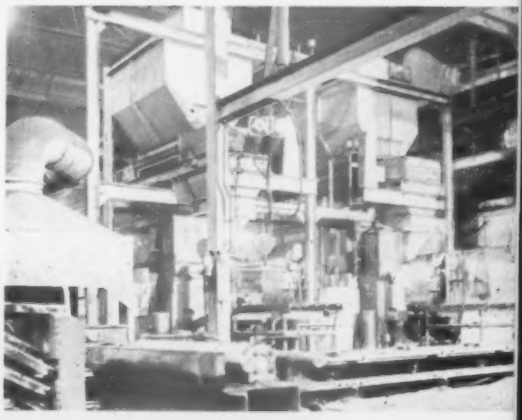


View of Plastic Conveyor and Shakeout Equipment and Casting Conveyor. Inset A. shows discharge end of automatic shakeout, empty box return unit and castings disposal. Sand falls through shakeout and returns to system. Inset B. shows heavy duty hot castings conveyor from automatic shakeout.





General View of Semi-Automatic Special Moulding Unit showing sand feed system, mould conveyor and handling plant.

OVERSEAS COMPANIES:

AUSTRALIA: Foundry Equipment (Australia) Pty. Ltd., Elizabeth, S. Australia
CANADA & U.S.A.: F. E. (North America) Ltd., Toronto
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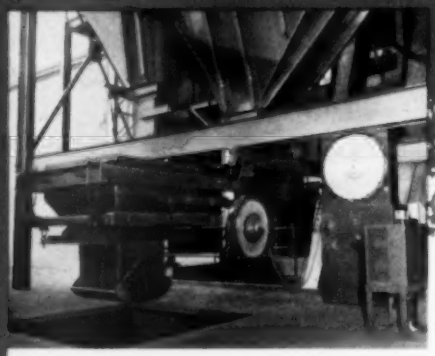
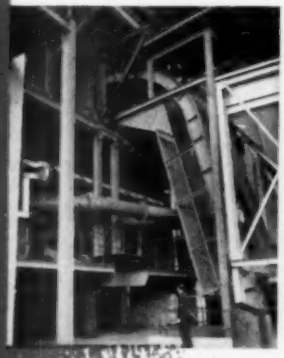


This weigh hopper feeds coke and limestone from the storage hoppers. Metal is magnet loaded into the recording floor weigh hopper, to which the coke and limestone are added.

Incandescent-Whiting Melting Plant at The Midland Motor Cylinder Co. Ltd.



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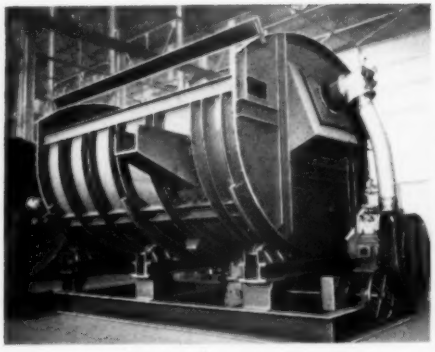

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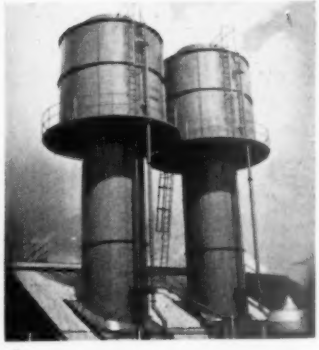

3

1 The made-up charge falls into the drop-bottom bucket of this swivel charger. The bucket has a capacity of 68 cubic feet, and the charger is power-traversed from one cupola to the other.

2 The cupolas are tapped into this oil-fired power-tilted receiver which has a capacity of 6 tons.

3 Incandescent-Whiting wet dust arresters are fitted to both cupolas. These arresters are 95 feet above ground level.

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- ☐ FP. 2—Incandescent dust arresters.
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Foundry Plant Division, The Incandescent Heat Co., Ltd., Cornwall Road, Smethwick, England. 5/4H/61.

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Completely mechanised melting plants by INCANDESCENT

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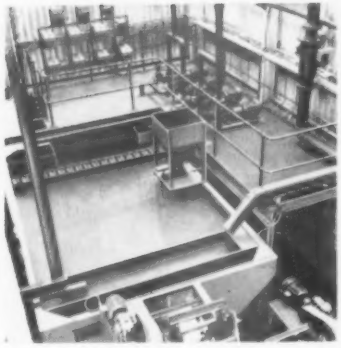

Water from the arresters passes to this automatic settling tank, which has a sludge discharge conveyor, acidity control, and water failure alarms. A similar tank handles granulated slag.

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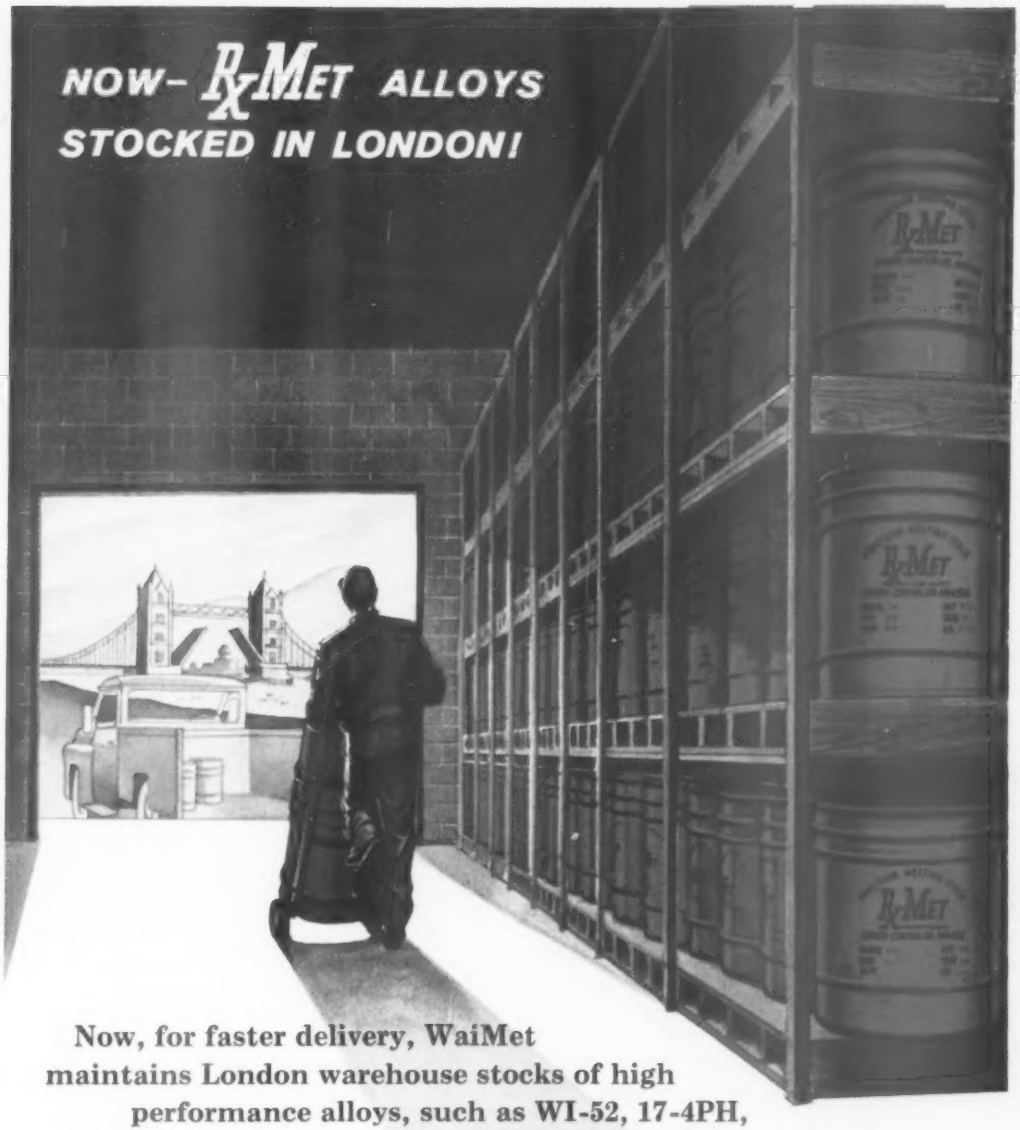

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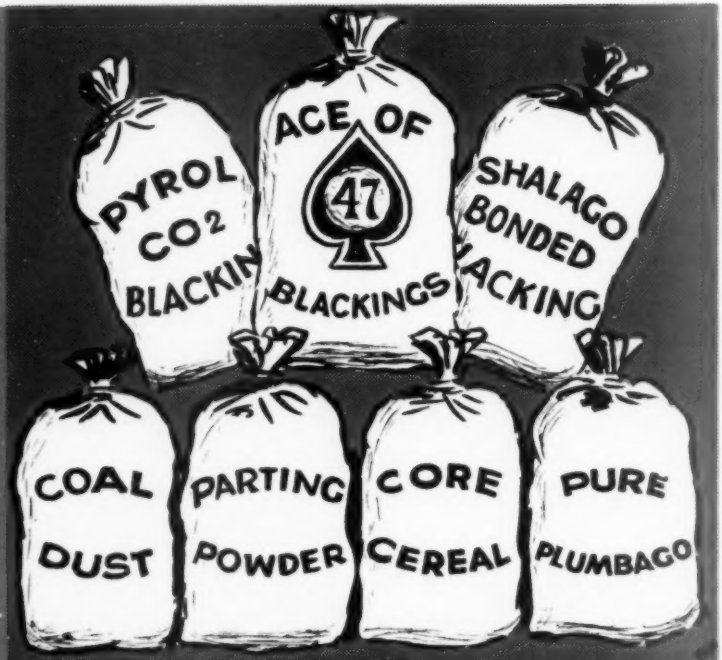

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Maksiccar Fire Putty	Plastic	Air Setting	Hand moulding or patching	1350 C	500 C	1100 C	140	2243
Stein Chrome Patch	Semi-Plastic			1750 C	600 C	1500 C	200	3204
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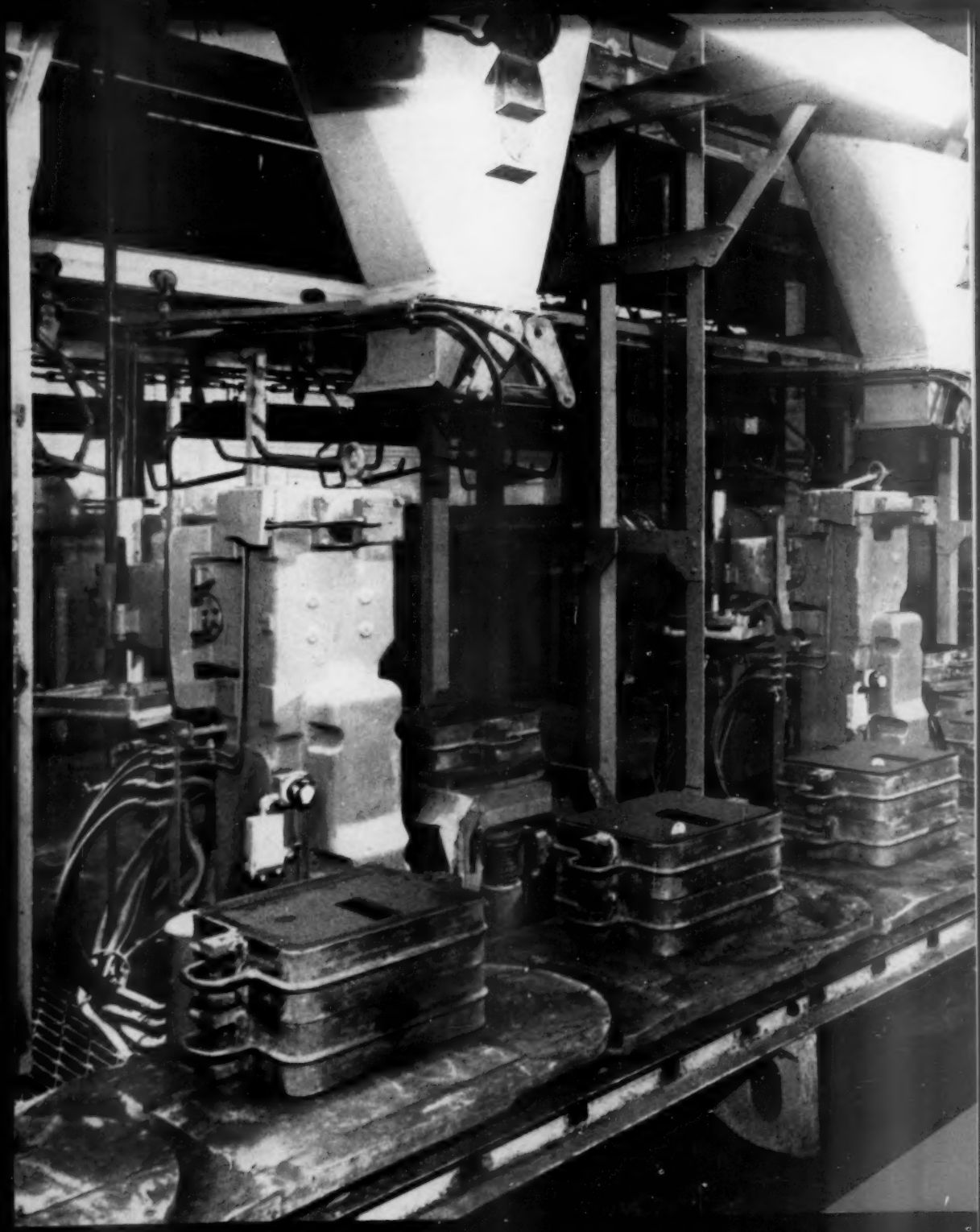

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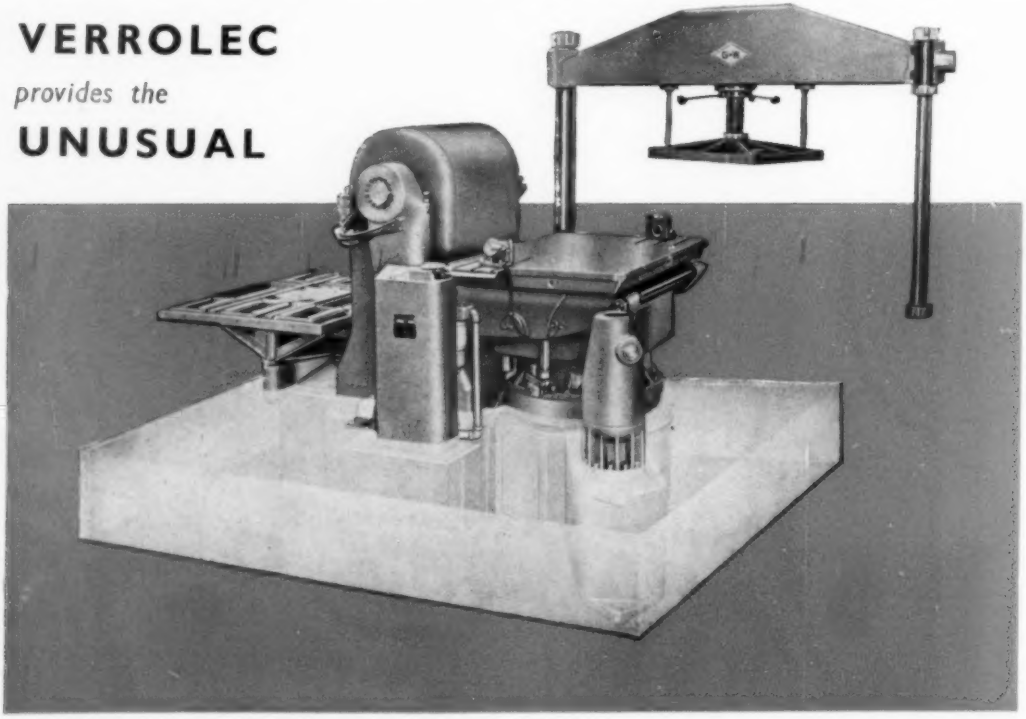

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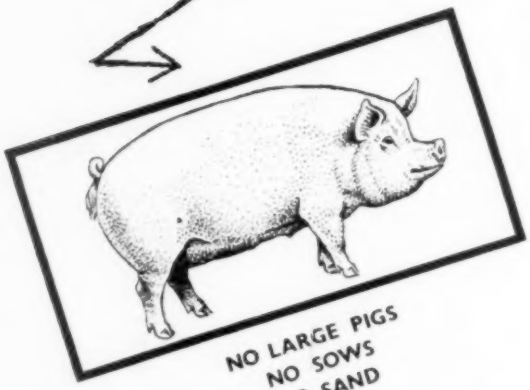

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PAGE

What's New in Malleable?

Summary of proceedings at Birmingham University Conference, April 27 and 28 655

Soho Foundry, 1796—1956

By A. J. Shore

Historical survey of a foundry famous for its association with the early steam engine 663

Qu'est—ce qu'il y a de neuf en fonte malléable?
Résumé des discussions à la conférence qui avait lieu à l'Université de Birmingham, le 27 et 28 avril. 655

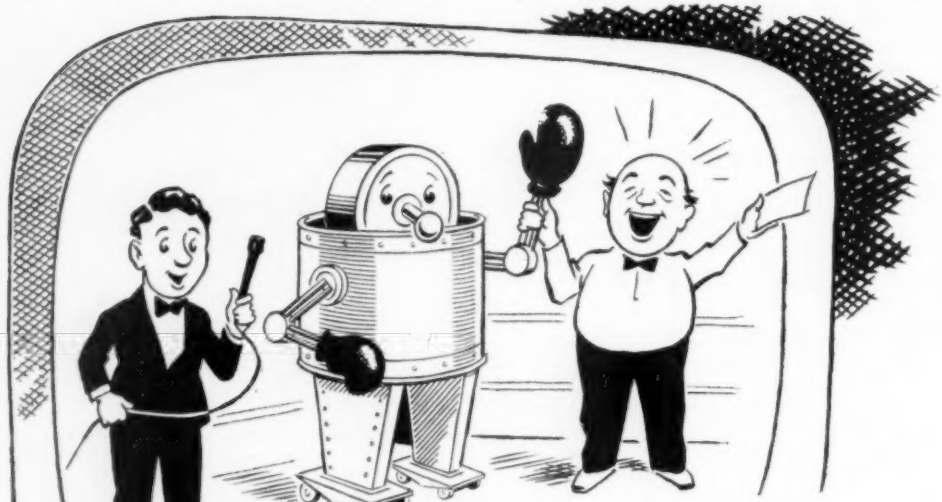
Fonderie "Boulton and Watts" à Soho, fondée en 1796. Par A. J. Shore.
Revue historique d'une fonderie fameuse pour son association avec les premieres machines à vapeur. 663

Was gibt es Neues in Temperguss?
Zusammenfassung der Besprechungen auf der Konferenz, welche am 27. und 28. April an der Universität Birmingham stattfand. 655

Die im Jahre 1796 gegründete Giesserei der Firma Boulton and Watts in Soho. Von A. J. Shore.
Ein geschichtlicher Überblick über eine Giesserei, die dadurch berühmt ist, dass sie mit den Anfängen der Dampfmaschine verknüpft war. 663

Features, News, Commercial Information and Statistics

Leader: A Century of Metallography 653
German Foundry Exhibition 1962 654
Correspondence: Korean Art Founding 654
Institution of Metallurgists 662
Joplin's Long-service Awards 662
Foundry Pit Hazard 662
New Nickel Markets Sought by INCO 662
Bulgarian Technology 662
Foundry Supplies Exhibition 662
Notes from the Branches 669
Film Reviews 671
Personal 672
News in Brief 674
Translation Service 676
Raw Material Markets 678
Company News (advert. section) 679
Pig-iron and Steel Production 680
Current Prices of Iron, Steel, and Non-ferrous Metals 682



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A Century of Metallography

The use of the photomicrograph to illustrate the structure of metals is such a commonplace in technical papers, textbooks and atlases to-day that it is taken very much for granted. Of special interest, therefore, is the recently published " History of Metallography," by Cyril Stanley Smith, himself a product of the school of metallurgy at the University of Birmingham, who has had such a distinguished connection with the Institute for the Study of Metals of the University of Chicago. This elegant volume treats the patterns visible on early metals due to structure, such as the swords of Damascus and Japan, and early studies of macrostructure, notably those of meteorites, and metallic fracture. Speaking of fracture, we apparently owe to Dud Dudley, in 1665, the division of cast-iron structures into grey (which he spelled as do our American friends to-day) white and mottled, which he called "motley." In 1855, Mallett, working on gun-barrel failures, related them to the mode of solidification of the metal, and illustrated the planes of weakness formed when crystals solidifying at right angles to rectangular faces actually meet. To-day this problem in grey iron has largely disappeared.

The pioneer of microscopic studies of the metals was undoubtedly Henry Clifton Sorby, a Sheffield amateur of science who had the advantage of being able to study whatever interested him. It is nearly a century ago, in 1863, since he made his first observations, and their effect remained dormant for nearly twenty years, in spite of his scientific eminence and of some measure of contemporary recognition. Robert Hooke had published his famous *Micrographia* in London as early as 1665. Sorby whose " pearly constituent " became pearlite, was followed by Tschernoff, Martens and Osmond. The outstanding British figures were Roberts-Austen, Arnold and Stead, but the science has always been international.

The routine examination of cast metals by the microscope is now well established, and details of sampling, polishing and etching procedures have been published many times, but there is some risk in treating examinations purely as routine. The technician can readily say whether a structure approximates to what is required or expected, but it takes a very skilful eye to interpret all that a microscopic section has to offer, and a trained observer is seldom content to examine an isolated spot in one sample. Development of the electron microscope and X-ray diffraction and other methods has tended to deflect attention from the optical microscope, but there is a move in recent years to return to it as a research tool, and it can never be superseded for the practising metallurgist, who is so much concerned with what Dr. Smith calls the " scale of aggregation " which it reveals and which cannot be ignored in industrial practice.

German Foundry Exhibition 1962

Scope and Programme of the Second GIFA

Exactly six years after the first—and again in Düsseldorf—the second German Foundry Trade Fair will be held from September 1 to 9, 1962. The organizers and sponsors (the German Foundrymen's Technical Association and the foundry machinery section of the Association of German Mechanical Engineering Firms) invite manufacturers of foundry machines and equipment and producers of raw and auxiliary materials of all kinds to participate. The offer to exhibit is—this time—restricted to these groups, and products of the foundry industry itself will not be on show.

Supported by exhibitors from various countries it is expected that GIFA 1962 will provide a comprehensive survey of the high standard of development achieved in foundry machines and equipment and will demonstrate enormous progress made in recent years towards foundry automation. Newly erected exhibition halls in Düsseldorf will offer additional space as compared with 1956, large enough to present exhibits in full operation.

The German Foundrymen's Technical Association will hold its 53rd Annual Meeting during the week of the fair and will arrange daily lectures dealing with many recent developments in the main themes of the exhibition. A workshop, where apprentices will mould and cast, is again likely to become one of the main centres of attraction to visitors.

Sectional Divisions

The following main sectional divisions will be organized for the show:—

Foundry Machines and Foundry Equipment

This section will cover: (1) Machines for mould and core production, automatic moulding units and core-blowing machines; (2) sand-preparation plant and sand-conditioning installations; (3) core- and mould-drying stoves; (4) melting and heat-treatment furnaces; (5) pressure-die-casting (air injection and plunger types) and centrifugal-casting machines; (6) fettling dressing tools; (7) mechanical handling and transport equipment; (8) pneumatic installations; (9) machine-tools for the production of patterns and dies; (11) surface-protection plant and equipment and that for (10) welding and flame-cutting; (12) workmen's safety and hygiene equipment; (13) equipment and machines for the testing of materials, laboratory apparatus and equipment, radiographic and spectroscopic apparatus; (14) devices for production control, measuring instruments, regulating and registering apparatus, and (15) lighting supply, exhaust ventilation, and air-conditioning plant.

Raw Materials and Supplies and Auxiliary Materials

In this category there will be: (1) moulding sands and core sands; (2) mould- and core-binders, blackings, mould- and core-washes; (3) refractory bricks, ramming materials and crucibles; (4) melting, moulding and fettling sundries; (5) die steels; (6) pig-irons and ferro-alloys, and (7) ingots and other alloys.

The first "GIFA," Foundry Trade Fair in 1956, as many will remember, was well supported by a large number of international exhibitors. Practically all the firms which participated, reported afterwards that they had done much good business. Held, as it then was, at the same time as the International Foundry Congress at Düsseldorf, the number of visitors surpassed, by far, all expectations.

Overseas firms are invited to participate also in this second Foundry Trade Fair and possible exhibitors are being circulated. The organization of the 1962 event is in the hands of Nordwestdeutsche Ausstellungs-Gesellschaft mbH, of Düsseldorf, and the fair committee is under the chairmanship of Dr. Ph. Schneider, the general secretary of the German Foundrymen's Technical Association. Other members of the committee are Mr. G. Engels (foundry machinery sub-committee VDG); Mr. W. Gieseke, (foundry machinery section of the Association of German Mechanical Engineering Firms); Mr. G. Hennicke, (electric furnaces sub-committee of the Federation of Electrotechnical Industries Association); Mr. H. Hüttenes (of the core binders section of the Federation of Chemical Industries); Mr. F. Vielwerth and Mr. P. Vogel (all the last three named are attached to the German Association of Mechanical Engineering Firms, Mr. Hüttenes being particularly associated with the foundry machinery section).

Correspondence

KOREAN ART FOUNDING

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—The Exhibition of Korean Art recently held in the Victoria and Albert Museum at South Kensington, gave the public an opportunity of studying the various examples of art bronze castings which were on view. From time to time, I have mentioned in my talks and writings that the ancient method of bronze casting invariably followed the lost-wax process.

My visit to this fine exhibition strengthened my opinion that these castings were produced by layering the wax over a made-up core closely resembling the statuette to be produced. The "investment" material would be applied over the wax in much the same way as practised in these times—eventually being fired off in a kiln built on the site. The metal was melted in a furnace built near the prepared mould, the results being very successful. Most of the statuettes shown were of subjects oriental in character, some may have been cast in a gilt bronze to which quantities of gold had been added.

The thicknessing of the bronzes in most cases was irregular, thus showing lack of a good method of holding the inside core firmly whilst the metal was being poured. One statuette had been built up on an ornamental base, allowing certain perforations to act as "coreprints" which helped the mould design, and also held the core in position whilst the metal was being poured.

Examination of the bronzes could only be of a casual nature, without handling, but the Koreans certainly seemed to have mastered the art of bronze founding, and I am wondering whether this craft has survived to the present time.

The examples of art founding exhibited had been carefully studied, there was nothing crude or slapdash and the final results, possibly due to the passage of years, showed some wonderful finishes in gilding. It is the writer's opinion that the patinas produced have not been surpassed in our time. The British Council may be congratulated on bringing this work to our country. Yours etc.,

ALBERT L. PARROTT, M.I.B.F.,
(Late foundry manager of the Morris Singer Company, Limited.)

May 6, 1961.

What's New in Malleable ?

Summary of Proceedings at Birmingham University Conference, April 27 and 28.

Close liaison between industry and the more advanced branches of scientific study is an important feature of contemporary higher education. The post-graduate foundry course of the Industrial Metallurgy Department of Birmingham University in 1958 included in its current session a conference on malleable iron addressed by specialists representing both the industrial and scientific sides of the field. The growth in importance of this form of co-operation between science and practical technology is emphasized by the fact that this was the third conference of its type organized by the Department.

The Department of Industrial Metallurgy of the University of Birmingham organized on Thursday and Friday, April 27 and 28, a conference on malleable cast iron. It was held in conjunction with the post-graduate course on Foundry Science and Engineering currently being held at the University. Professor E. C. Rollason, head of the Department of Industrial Metallurgy, explained at the opening session that in the Department, there were several courses available, and the post-graduate course on Foundry Science and Engineering was held every two years, and the malleable iron conference formed a part of it. In addition to students, representatives from the malleable foundry industry had been invited to participate, with the idea of securing a cross-fertilization of ideas between research and practice.

Prof. Rollason said, some speakers would review present knowledge in the field and others indicate some of the current problems in the industry, and these papers would lead to a general discussion of the three main topics, metallurgy, properties of malleable iron and its production.

In all, five papers were presented at the Conference, three by research workers, and two from industry, one of the latter emanating from Germany. The split-up of those attending the Conference was about one-third from the University and two-thirds from the industry in the total of 75 registrations. Those delegates coming from industry included a large proportion of the membership of the British Cast Iron Research Association's malleable subcommittee, together with representatives of many of the country's malleable foundries, and also including one member, Mr. K. G. Bylund, from Sweden.

Early Proceedings

The proceedings of the Conference commenced at 2.0 p.m. on Thursday, April 27, when Professor E. C. Rollason welcomed the delegates. Session one of the Conference then dealt with the metallurgy of malleable iron and was under the chairmanship of Mr. I. C. H. Hughes, M.SC., assistant director, British Cast Iron Research Association. Two papers were presented during the afternoon, one by Dr. J. Burke, B.SC. (of the University of Liverpool) on " Kinetics of Malleablizing " and the other by Mr. B. Walker (the University of Birmingham) on " Metallurgy of Graphite Formation." Before a discussion of these papers, there was a break for refreshments. What follow next are abstracts of the various papers presented, with mention of a few of the major topics raised in the discussions which followed their presentation:

Kinetics of Malleablizing

By J. Burke, Ph.D., B.Sc.

In this paper, the experimental and theoretical work on the mechanism and kinetics of first-stage graphitization of both commercial and high-purity white cast irons were reviewed and discussed by the author. In the course of his remarks, Dr. Burke said that most of this work had already been published, but he would present some new results and ideas. Although there was a considerable volume of data available on this topic, only a small amount of it contributed anything useful to an understanding of the process on account of the lack of control of the experimental conditions under which it was amassed, he said. Malleablizing reactions occurred by classical nucleation and growth and most of the recent work had attempted to interpret the general kinetics in terms of these two component processes, and the author said that these ideas would be considered in the light of recent work in the UK and America on the general problem of precipitation kinetics.

Growth of Temper-carbon Nodules

Considering the growth of the temper-carbon nodules in the very simplest terms, the basic steps were (1) solution of the carbide phase in austenite; (2) diffusion of carbon through austenite, (3) removal of carbon atoms from the solid solution at the graphite interface and (4) counter diffusion of iron, silicon and other alloying atoms away from the graphite. Each of these component steps had been suggested at one time or another as the rate-determining step, and Dr. Burke said that the merits of these various suggestions would be examined and it would be demonstrated that those based upon activation-energy concepts were unreliable.

The paper stated that the available evidence did suggest, however, that the controlling mechanism

differed under different conditions of metal microstructure, composition and temperature. This was to be expected, since the basic processes would not be similarly dependent upon these variables, and work on the analogous process of decarburization supported this contention. The author continued by saying that the main macroscopic, qualitative features of the nucleation of the graphite nodules were well established. The graphite was formed at structural discontinuities, such as austenite/cementite interfaces in high-purity alloys and inclusion surfaces in commercial-type alloys. Nucleation occurred progressively during the early stages of graphitization and then ceased, after which the small nodules re-dissolved. Some of the questions concerning the variation in nodule number with composition, microstructure and thermal history of the metal could be qualitatively explained. However, the author added that, quantitively, the position was far from satisfactory. An elementary calculation of nucleation rates was given in terms of nucleation theory. Not only were the experimental observations difficult to reconcile with this theory, but it was also difficult to understand the effects of alloying elements, particularly silicon.

Finally, in discussing the present models for the malleablizing reaction, the author drew attention to the difficulties introduced by the departure from even metastable equilibrium, due to the rapid solidification rate, and influence of local segregation of alloying elements, both before and during graphitization.

Metallurgy of Graphite Formation*

By B. Walker B.Sc.

The second paper on the subject of malleable-iron metallurgy was given by Mr. B. Walker of the University of Birmingham and was entitled "Metallurgy of Graphite Formation." The author said it was well known that the slower the rate of heating to first-stage graphitization temperature of the malleablizing process, the more numerous were the graphite nodules in the final microstructure. Work by Palmer at the British Cast Iron Research Association had shown that white irons added to a furnace at temperatures above 700 deg. C. gave no increase in nodule number. The increase in nodule number must, therefore, be connected with some phenomena occurring below the eutectoid temperature. Brown, in America, indicated that a preliminary pre-anneal at 400 deg. C. and then first-stage graphitization gave the maximum number of nodules in malleable cast irons. He indicated that graphitization could take place during the sub-critical anneal and that these particles of graphite acted as nuclei during subsequent first-stage graphitization.

The author said that his present work had been carried out as part of a general study of metallurgy of malleablizing in order to examine essential phenomena and explain these in metallurgical terms. The effect of the heating rate was discussed in his paper, but it was hoped that other points would arise in discussion.

Observations

A white cast iron of the following composition had been used in all the experimental work: C 2.8, Si 1.0, S. 0.05, Mn 0.4 and P 0.05 per cent. The author then went on to detail the results obtained from the various experimental observations made on this white iron, as follow:—(1) There was possible a maximum rate of heating to malleablization temperature above which no change in nodule number was found; (2) a preliminary anneal at 400 deg. C. and then first-stage graphitization gave the maximum number of nodules in the white iron tested; (3) the addition of certain alloy elements did not appreciably alter this pre-anneal temperature; (4) it had been found that an "incubation" period was associated with this phenomenon, leading to the idea that some type of precipitation was involved; (5) heat-treatment for various times at 700 deg. C., followed by water quenching and then sub-critically annealing at various temperatures and for various times and finally graphitizing gave rise to a series of nodule-number curves (illustrated by slides) which showed a marked resemblance to precipitation hardening curves found in Al/Cu alloys, and (6) the sub-critical annealing process, he said, appeared to be only partially reversible, suggesting that the precipitation was relatively stable. A mechanism based on precipitation of carbon from supersaturated ferrite was proposed to account for these experimental observations. The nature of the precipitate was at present unknown, though there was some evidence that it might be graphite, Mr. Walker concluded.

Reconciling Theory and Practice

Mr. Hughes, who continued as chairman for the discussion of the first two papers, had earlier explained that the afternoon's papers dealt with the more fundamental aspects of malleable-iron metallurgy. He opened the discussion by requesting complete informality from speakers and called first on Mr. Hogan of Brisbane University to propose a vote of thanks to the lecturers, which was accorded with acclamation. Thereafter, somewhat to the surprise of some of the members present, who may have regarded the first two lectures as rather "highbrow," questions and replies came fast and furious, showing that indeed the papers had been well assimilated.

Topics discussed included questions as to the effect of hydrogen on rate of graphitization and the relative effects of both graphitizers and carbide-stabilizers. Here the reply was that the major effect of alloying elements appeared to be on the nucleation side with the exception of silicon, the effect of which was difficult to explain in those terms. Asked why more nodules were found close to the surface of a section of metal Mr. Walker replied that it was presumably because of the high rate of cooling at the edge of a section and

* The investigation reported was made possible by the receipt by the author of an Andrew Carnegie Research Fund grant and a full account of the work is to be offered for publication by the Iron and Steel Institute in the near future.

the absence of pressure; this applied also to hot stripping of castings as a means of increasing nodule number, and this in turn gave reduced total annealing time. The effect of boron was described by Mr. Hughes as probably combating that of chromium as a carbide-stabilizer and permitting growth in nodule number. In reply to further questions, Dr. Burke elaborated at length on his conception of surface energy effects on nodule growth. Asked why he felt justified in neglecting the effect of pressure, he said that this would still further confuse the issue without adding, he thought, anything to the basic mechanism as he understood it.

At the conclusion of this section of the programme, it was clear that the comments could be resolved into an attempt by the practical delegates present to interpret the theories and researches put forward by the lecturers and, on the other hand, by the lecturers endeavouring to meet the practical men halfway and reconcile their theories with the day-to-day findings of industry. (If nothing else had come out of this Conference, the writer feels that this reconciliation would have been value enough in itself.)

The day's proceedings concluded with the chairmen of the various sessions and the lecturers joining the senior staff of the Department of Industrial Metallurgy at dinner at their staff club. Professor Rollason took the chair and the proceedings were completely informal.

Friday's Programme

Friday's proceedings of the Malleable Iron Conference commenced at 9.30 a.m. under the chairmanship of Mr. H. G. Hall, F.I.M., of Castings, Limited. Two papers were presented and covered consideration of the properties of various types of malleable iron as influenced by methods of production, heat-treatment, etc. The first lecturer was Mr. C. T. Moore, A.I.M. (British Cast Iron Research Association) and his subject: "Properties of Blackheart Malleable."* The second paper, which emanated from Germany, was entitled "Pearlitic Malleable" and was given by Mr. R. Opitz of W. Hundhausen KG. What follow are synopses of the two papers, and then a report of the discussion.

Properties of Blackheart Malleable

By Mr. C. T. Moore, A.I.M.

Mr. Hall introduce the lecturers to the delegates and in his remarks, contrasted the position of the UK malleable industry when he entered it some 30 years ago with conditions of the present day. This formed a useful basis against which to assess what followed of to-day's theory and practice in the malleable industry and the free interchange of thought which now exists among personnel in mealleable foundries.

Mr. Moore said that the increased use of blackheart malleable iron in recent years had brought a demand for higher tensile-properties. The effects of carbon, silicon and phosphorus on tensile strength had been investigated and the influence of these elements on impact properties and, in particular, the ductile-to-brittle transition temperature had been assessed. The author stated tensile properties were improved by increasing the silicon or phosphorus contents and by lowering the carbon content. Increasing the former, however, invariably led to a deterioration in impact properties, while a reduction in carbon content had little effect on impact ductility. The best combination of impact and tensile properties was achieved, he said, with low-phosphorus, low-carbon, and medium- or high-silicon contents. A sub-critical quenching and tempering treatment lowered the impact transition temperature of ferritic blackheart malleable to well below room-temperature, and also improved tensile properties.

* Being published in the May, 1961, issue of *BCIRA Journal*.

Pearlitic Malleable Iron

By Mr. R. Opitz

Following a break for coffee, Mr. Opitz delivered his paper on "Pearlitic Malleable Iron." In his opening remarks, he said that the objective of the paper was to define pearlitic malleable iron (GTP, German Standard), and to analyse its place within the grades of malleable irons, as proposed for the German standards organization.†

Whiteheart malleable iron, the author began, was subject to heat-treatment in an oxidizing atmosphere in order to remove carbon as well as to transform primary carbides. The resulting decarburized surface-zone had a different depth according to the annealing temperatures, times and conditions. Small sections could be essentially free from carbon, but with greater sections, a ferritic/pearlitic or else pearlitic structure was partly present, together with occluded temper-carbon. This heterogeneous material, Mr. Opitz thought, could be contrasted with blackheart malleable iron (GTS, German Standard), the matrix of which could be obtained ferritic throughout all cross-sections. Annealing of blackheart was carried out in a neutral atmosphere and all the carbon was precipitated in the form of temper-carbon. The ferritic matrix resulted in high elongation values, yet retained moderate yield and tensile strength.

Strengthening the Matrix

It had appeared desirable, the author said, to strengthen the matrix of this material; the carbon necessary for this was available, and it was merely a question of deciding the annealing cycle, *i.e.*, whether the carbon from the combined form in which it was present in the original white iron was transferred fully into graphite, or otherwise a part of it was retained in the matrix during the austenite transformation.

Mr. Opitz stated that the well known heat-treatment processes for steel could be used and that the relationship of the ferritic blackheart malleable iron to the pearlitic could be likened to that of

† The author points out that the proposals he advanced have not yet been accepted for the German standard DIN 1692.

an annealed low-carbon steel to a quenched and subsequently tempered steel with a medium carbon content. According to this comparison, a low-carbon steel (having the same matrix as blackheart malleable iron) was transformed into a heat-treatable steel (*i.e.*, the matrix of pearlitic malleable iron). The final mechanical properties of the material were also affected by the occluded temper carbon, and the machinability of pearlitic malleable in contrast to that of comparable steels was to a considerable extent improved, as the production of short brittle swarf and chippings provided better tool-life in the machine-shops.

Compositions and Treatments

The author said there were numerous methods of heat-treating pearlitic malleable iron; these depended on the composition of the iron and the furnaces available. It was usual to produce pearlitic malleable from irons of the same melting and composition characteristics as for the production of ordinary blackheart iron. This facilitated producton and only required the choice of an appropriate heat-treatment method, that is, a procedure which would give the most favourable properties in the finished material. The use of small heat-treatment charges made possible good and uniform tempering in air or oil and conferred uniformity on the castings after heat-treatment. Certain alloying additions could be of advantage, Mr. Opitz continued, as was also the case with heat-treatable steels. As a rule, their carbide-stabilizing effect on the metal was not limited to the eutectoid range, with the result that the annealing time in the first stage was extended.

Known factors affecting the production of malleable iron, such as carbon and silicon contents, ratio of manganese to sulphur, chromium content, and additions of boron or bismuth, were important. It was true that the control of these elements in the composition permitted the casting of larger sections in comparison with whiteheart malleable, but the range of chemical composition was still narrow and required careful regulation and control of melting and annealing operations.

Basically, pearlitic malleable should not be regarded as a new material, he concluded, but the adoption of heat-treatment methods similar to those for steel signified for a cast material that parts for both construction and engineering applications could be produced by ordinary foundry methods with all the attendant advantages. Such castings became in fact (after annealing) a range of heat-treatable steels of medium-carbon content the treatment being selected according to mechanical properties desired. Although such operations appeared straightforward, they required careful control in foundries in order to reach and guarantee the necessary uniformity.

During his lecture, Mr. Opitz showed a number of slides demonstrating phases in the production of pearlitic malleable, both as graphical representations of heat-treatment cycles and the attendant microstructures of the material. At its conclusion, he also showed pictures of malleable plant at his works at Schwerte, Germany, particularly illustrating his firm's automatically-controlled continuous heat-treatment plant for pearlitic malleable, which operated on a 20 to 22-hr. time-cycle for castings 15 to 18 mm. thick. Finally, he showed a number of pictures of castings from the German firm's production of pearlitic malleable, together with a number of "Armasteel" castings produced in America, the weight range being up to 2 cwt.

Amelioration of Properties

Discussion on the two morning papers centred mainly around the production of higher properties from malleable by increasing the silicon rather than phosphorus and taking care to avoid mottling in heavy sections. In duplexing cupola/electric-arc material for malleable, the necessity had been stipulated for charging graphite-free material into the cupola, but the alternative view was put forward in the discussions that mottling might possibly result from the use of the electric arc itself. The very-low carbon content material favoured by Mr. Moore was thought by the founders present to be rather impracticable because of difficulty of running and feeding varying sections. It was also thought that American founders were better equipped to produce special types of malleable because of the relatively larger markets in the States and the possibility of rationalizing production in different foundries of special types.

The value of a sub-critical quench from 650 deg. C. followed by tempering of the iron at 350 deg. C. was stressed as it lowered the transition temperature of what might otherwise be temper-brittle malleable; but the procedure was realized as being quite costly. When the question was asked of how the British Cast Iron Research Association obtained their specimens for impact testing and what was the degree of reproducibility, the reply was given that they took the ordinary malleable bend-test bar and cut it into a number of notched impact-bars, as a means of securing a number of impact specimens from the same sound castings. This procedure was useful for carrying out tests at different treatment temperatures. On the other hand, the German practice seemed to be to use separately-cast test-pieces and the UK founders were of the opinion that this method might not be reliable because of feeding problems, and variations in the quality of the surface layers.

Professor Rollason pointed out that methods were available for heat-treating steels to vary the temper/brittle transition temperatures—why couldn't this be done for malleable? He was told that the same sort of considerations do apply with malleable, but it was a matter of practical working out, bearing in mind the added complication caused by the presence of free carbon.

Control in a Malleable Iron Foundry

By Mr. J. Roxburgh

After luncheon, the final paper of the Conference was presented, with Dr. V. Kondic, B.SC.

(Department of Industrial Metallurgy, Birmingham University) in the chair. The lecturer was Mr. J. Roxburgh of Ley's Malleable Castings Company, Limited, who had for his subject "Control in a Malleable Iron Foundry."

The set-up at Ley's Malleable Castings Company, Limited, has been several times described in this JOURNAL (the most recent being an account of the firm's new "1958" Foundry, appearing in the February 25, 1960 issue), and Mr. Roxburgh dealt with control operations embodied in the day-to-day running of these foundries. First, he discussed the need for control by the founder over raw materials, operational procedures and finished castings as a means of securing consistency and reliability of product. To this end, he elaborated upon liaison between supplier and customer, possible simplification of design of castings, quality acceptance levels, pattern and corebox equipment and sample castings, including a survey of causes of scrap.

Next, the author dealt with a number of aspects of control in a fully-mechanized foundry, first as regards metal and melting; cupola/electric furnace duplexing; composition control; tapping temperature and comparisons between hot- and cold-blast cupolas. On the subject of moulding-shop surveillance, Mr. Roxburgh dealt with the adoption of a unit moulding sand and its properties as controlled for one-shift and two-shift working, stressing the importance of shatter index and green-compression testing. Coresand control and coreblowing methods, the principles of feeding and gating, types of feeder, the use of slag traps and shills, covered the general consideration of foundrywork, which the speaker then related to detailed operations in the making of a passenger-vehicle gear-carrier casting of quite complex shape in the firm's mechanized plant.

Continuing the subject to annealing, Mr. Roxburgh dealt first with electric ovens—the batch-type elevator furnace for ferritic malleable and the horizontal continuous oven for pearlitic types. Discussing straightening processes, the use of oil-hydraulic presses and dies was instanced and mention was made of the use of various inspection gauges, jigs and fixtures. Finally, the subject of non-destructive tests which were applied in the group's foundries was dealt with by Mr. Roxburgh, and he detailed also the applications of crack detection, Brinell testing and gamma radiography.

Final Session

A further session after the afternoon tea-break (and also under the presidency of Dr. Kondic) was devoted to discussion of all previous papers and contributions were invited from the audience, both on preceding papers and on general topics of interest to the malleable industry—metallurgy, properties or production.

Initially, a vote of thanks to Mr. Roxburgh was proposed by one of the students and warmly accorded.

Commenting upon Professor Rollason's questions earlier in the day, Mr. Hughes stated that in nodular irons with a ferritic matrix the impact properties were affected by grain size, finer grain-size giving a lower transition temperature in the same way as would be observed for steel. He believed that the same result would be obtained for blackheart malleable iron if the grain size could be varied. At present this was difficult because of the prolonged nature of the heat-treatment, but he was confident that some method would be found for making this variation in the future. It had also been shown for nodular irons that the results from slow-bend tests upon notched bars were in agreement with impact-test results. Mr. Hughes was confident that malleable iron would behave in the same way. Neither of these tests appared to be particularly desirable as routine tests for malleable iron. He entirely supported Professor Rollason's view that many aspects of the treatment technology of malleable iron were closely analogous to those of steel.

On the Right Lines

Asked whether the assembly thought the Birmingham and Liverpool research teams were tackling the right sort of research, an opinion was expressed from the audience that research seemed to be on the right lines, but the industry was somewhat slow in applying it. The speaker said he had been pleased to find that both of the university teams did realize practical limitations of the work they were doing.

Asked why the sub-critical quench and tempering could make so much difference to malleable, Mr. Moore said there was no complete answer. It might be that segregation of constituents during the cooling from the original anneal was followed by homogenization in the re-anneal and the material was retained in that condition by the final quench. Other replies to questions were briefly as follow:

There seems to be some analogy between temper-brittleness of steel and the brittle phenomenon of malleable iron reported here. In fact malleable castings may suffer from temper embrittlement when they are galvanized at and quenched from 450 deg. C. (a heat-treatment likely to cause temper-embrittlement). However, the present studies had not been concerned with embrittlement due to a special heat-treatment in the temper embrittlement temperature range of 450 to 500 deg. C., but the susceptibility of brittle failure had been found to increase in irons annealed normally due to increases in their silicon and phosphorus contents made to develop higher tensile-properties. The similarity between the two types of embrittlement was that quenching the iron from 650 deg. C. prevented brittle failure occurring at normal temperatures, due to the effect of high phosphorus or silicon contents and also avoided temper embrittlement due to the effect of a subsequent galvanizing treatment carried out at 450 deg. C. It was necessary to appreciate that the cooling rate employed for castings following completion of the second stage of annealing was an important factor in determining the susceptibility to brittle failure of the iron at sub-zero temperatures. In this respect

the extent which one might reach optimum properties throughout the whole production was a function of the type of annealing equipment used and therefore the horizontal continuous annealing ovens in which small batches of castings are discharged and cooled fairly rapidly at the end of annealing probably provide the best conditions.

As to gating, it was stated that patterns, runners and feeding heads were usually designed and developed by trial and error after an initial set-up based on previous experience of similar jobs. It was not thought possible to calculate the runners and feeders for all designs of castings.

One of the speakers said that for new personnel entering the industry, he had found a background of science was indeed necessary. Such people might start in the firm's laboratory and be transferred to the production shops afterwards; there, a man's background was very important and an academic training on a broad basis could be of great benefit to his future career.

Other Points of Interest

On the question of feeder-heads for malleable castings, it was recommended that these should be placed very close to the casting (yet permit breaking off without breaking in) and stay molten longer than the casting itself. Malleable iron was described as not being a skin-forming metal so that the use of breaker cores in feeder-heads was less necessary. Insulating- and exothermic-heads had been tried by one of the practical founders present, but found rather expensive and difficult to apply to mass-production jobs. A margin of safety was essential, it was stated, when deciding on feeder size. Other questions concerned the use of rusty scrap in the charge. On this topic a quite long discussion took place on whether or not it was in fact possible to produce oxidized metal—to which a tendency to hot-tearing might be attributed. Summing this up, Mr. Hughes said all would agree that metal quality could vary. All melts were more or less oxidizing, but he thought it a mistake to say that the presence of more oxide in a slag meant that there was more oxygen present in the metal. Oxidized iron would in fact seem to be a misnomer and often a scapegoat, he added, concluding with an offer of BCIRA assistance with gas analysis of samples to any member who wanted to "lay this bogey" of oxidized iron. He thought hot-tearing might be a symptom of some other fault.

One speaker suggested that hot-tearing might be related to the size of the original gamma-iron dendrites, but it appeared that no experimental work was available to support this view.

Annealing-ore for Whiteheart

During the discussion, Dr. J. C. Wright, of the Birmingham College of Advanced Technology, made a valuable contribution on the sticking of ore when annealing whiteheart malleable. Extensive researches, he said, had resulted in the development of a cleaning process for ore returns and magnetic separation had shown some success with no loss of annealing (decarburizing) properties. Here, another speaker said that his firm was using a regenerative process for a special high-silica ore purchased from Germany. The process was Patented and it was necessary to treat about 100 tons per week before it became economical.

The final section of the discussion was on the details of running methods. On the subject of "spinners" and slag removal, the opinion was given that they were effective, but rather wasteful of metal and that slag traps were probably more efficient. The view was expressed that there could, with profit, be more empirical research undertaken on running methods—for instance, on establishing data as to the effect of head height, the influence of aluminium on hot-tearing, the reasons why feeding results were often erratic and the possibilities of pressure feeding, and so on.

Concluding the session, Dr. Kondic surveyed the proceedings of the whole Conference and expressed delegates' thanks to all the speakers and discussion contributors.

(It is proposed to publish certain of the Conference papers *in extenso* in this JOURNAL in due course.)

High Cost of Corrosion

Corrosion is costing British iron and steel trades about £600,000,000 per year in repairs, Mr. A. L. Thorogood, a principal scientific officer with the Department of Scientific and Industrial Research, said at a conference of Scottish members of the National Industrial Salvage and Recovery Council, at the National Engineering Laboratory, East Kilbride, on May 11. He recommended that in the national interest the industrial creed should be "waste not, want not."

The Salvage and Recovery Council, he said, helped manufacturers to find a use for such presumably waste materials as ivory dust, apricot stones, and fuel ash. Much was being done, too, to cut down the annual waste of millions of gallons of paint which occurs during respraying. The "overspray" was now being recovered and made into a very good quality paint. More than 30 firms were reported at the conference; the Council have about 200 members in Scotland.

British Marine Research Equipment

Sensitive scientific equipment which will measure the magnetic contours of the Mediterranean sea, and possibly the Indian Ocean, is on its way to a research establishment in Italy from the electronics department of Bruce Peebles & Company, Limited, Edinburgh. The equipment is so sensitive that while it was under test near the staff putting green at the electronics department, the metal on the clubs upset the magnetic field and affected the measurements. By measuring the magnetic field in the sea, the contours can be plotted in the same way as geographical contours and provide information of interest to geophysicists and oceanographers. The equipment is called a Proton Spin Magnetometer. Two "fish" housing electronic circuits towed 1,000 ft. astern of a ship send back signals, the frequences of which are directly proportionate to the earth's magnetic field. These frequences are accurately measured and taped by equipment on board the ship.

News from India

The total number of iron and steel foundries now working in India is about 2,000 which have an approximate total installed capacity of 1,400,000 tons per annum. Disclosing this at the annual general meeting of the Indian Foundry Association held in Calcutta, its president, Mr. P. N. Gosh, said that the industry had a very substantial employment potential.

He said that the development of the big casting projects in the "public sector" was causing some anxiety to the industry and pointed out that there was no reason why the public and private sectors should not grow and exist together working side by side as complementary units. He pointed out also that the non-availability of adequate quantities of hard coke was a "bottleneck" which had long been hampering the activities of iron and steel founders.

Automobile Foundry in Madras

As the manufacture of automobiles calls for precision castings for cylinder-blocks, cylinder-heads and other components, Ashok-Leyland Motors, Limited, in association with Leyland Motors, Limited, of the United Kingdom, have established a well-equipped foundry to cater not only for the needs of Ashok-Leyland, Limited, for the production of their Leyland "Comet" trucks, but also for the general casting requirements of other automobile manufacturers in India.

While India has a number of foundries operating throughout the country, this will be one of the first attempts in the area to employ advanced techniques of production by mechanization, control of quality, high-speed manufacture and precision.

The total installed capacity of the foundry is expected to be 750 tons per month of both ferrous and non-ferrous castings in the first phase now under construction and full-scale production in this foundry is expected to commence in August this year.

All the necessary plant and equipment have already been ordered and some of it is on its way to India for installation. The conveyor system has been so laid out that the entire system will be visible for easy access and maintenance, thus obviating the necessity of having underground passages.

Machine-tool Factories

Two more machine-tool factories in the public sector will be established in India during the Third Five-Year Plan period. This was disclosed in Bombay by Mr. M. K. Mathulla, managing director of the State-owned Hindustan Machine Tools Factory of Bangalore, prior to his departure to East Germany as leader of a three-man delegation to finalize arrangements for technical collaboration with East Germany for these factories. The two new factories, Mr. Mathulla said, were estimated to cost Rs. 50,000,000. They were likely to be completed and go into production within two years.

Technical collaboration for doubling output of the Hindustan Machine Tools factory will also be discussed by the delegation with East German officials, it was stated. During his four weeks stay in Europe, Mr. Mathulla will finalize and probably sign an agreement with East German Government-owned concerns for the manufacture of a wide range of advanced machine-tools either in the new factory now under erection near the existing factory, or in factories proposed to be set up elsewhere in India. He will also go to France to finalize an agreement with the Renault automobile concern for taking up the manufacture of mass-production machines within Hindustan Machine Tools.

The new factory, financed completely by Hindustan Machine Tools, is expected to be completed in two or three months. Installation of machinery and training of personnel to man the factory are now in progress. Production of machine tools in the Hindustan concern, which stood at 135 in 1956-57 when it was started, has touched the 1,000 mark during the current financial year. Since its completion, the factory has produced 2,660 machines of five different types up to the end of February this year, out of which nearly 2,460 have been sold and another 100 machines are currently awaiting despatch.

Tool-bits Plant for Bangalore

Representatives of Bohler Brothers, of Austria, have successfully completed talks with private firms in Bangalore for setting up a tool-bits plant in Bangalore. The rated capacity of the plant is 8,000 dozens a month. The Austrian company will supply technical "know-how," it is announced. Their representatives have already visited various parts of India and had talks for setting up plants to manufacture valves, files, welding machines, machine knives, etc. They also had talks with the Government of India on the prospects of setting up an alloy tool-steel plant in India.

Heavy Electricals' Project

Good progress is being made in the construction of the factory for Heavy Electricals, Limited, in Bhopal. The production programme includes manufacture of switchgears, control gears, transformers, etc., and it is estimated that output by the end of March, 1962, will be valued at Rs. 35,000,000. It has been decided to establish with Czechoslovakian assistance a plant for the manufacture of heavy-electrical equipment, and it is also proposed to establish a second plant with Russian aid.

Foundry/forge in Ranchi

A further stage in the development of the foundry/forge project at Ranchi has been reached with the signing of two agreements between the Heavy Engineering Corporation and Technoexport of Prague. The first agreement is for additional machinery and equipment, to the value of Rs. 76,000,000 f.o.b. for the foundry/forge, and the second agreement relates to further machinery and equipment required for the first stage of the project (at a cost of Rs. 7,700,000).

South American Notes

New Copper Mine opens in Chile

Copper output by the large mining companies in Chile in the first quarter of this year totalled 127,068 tons as against 126,697 tons in the corresponding period of 1960. The new copper mine of the Empresa Minera Mantos Blancos, an associate of the Mauricio Hochschild group, was opened in Chile in March; it has a proved reserve of 10,000,000 tons of low-grade ore, and a possible further reserve of 20,000,000 tons. The mine will employ over 1,000 people. It is expected that the initial copper output—99.94 per cent. pure—will be 16,000 to 18,000 tons per annum. The plant has so far cost US $26,000,000.

More Iron-ore produced in Venezuela

Iron-ore production in Venezuela in January and February this year amounted to 3,200,000 tons as compared with 3,100,000 tons in the similar two-month period last year. According to the Venezuelan Ministry of Mines, the income of the country's iron-ore industry last year totalled 576,800,000 bolivares, as against 474,500,000 bolivares in 1959—a 21.6 per cent. increase.

Institution of Metallurgists

At the seventeenth annual general meeting of the Institution of Metallurgists, held on May 17 at the Park Lane Hotel, London, Dr. N. P. Allen, M.MET., D.SC., F.R.S. (National Physical Laboratory) was elected president of the Institution in succession to Mr. W. E. Bardgett, B.SC. The following elections were also made:—*President-elect:* Dr. E. G. West, B.SC., PH.D. (Aluminium Development Association), in succession to Dr. Allen; *vice-presidents:* Mr. F. Dickinson, B.SC., F.I.M. (International Nickel Company (Mond), Limited), and Dr. L. Northcott, PH.D., D.SC., F.I.M. (Armament Research and Development Establishment, Fort Halstead, War Office); *hon treasurer:* Mr. L. W. Derry, B.SC., M.SC., F.I.M. (Battersea College of Technology), (re-appointment); *ordinary members of Council:* Mr. H. Morrogh, F.I.M. (British Cast Iron Research Association), Mr. S. S. Smith, M.MET., F.I.M. (Imperial Chemical Industries, Limited, metals division), and *ordinary member of Council:* Dr. J. C. Wright, B.SC., PH.D. (Birmingham College of Advanced Technology).

Luncheon

Following the annual general meeting, the Institution held its annual luncheon at the Park Lane Hotel, London, with the president, Dr. N. P. Allen, in the chair. The guests included Sir Patrick Linstead, Sir William Cook, Dr. Reginald Bennett, M.P., the Mayor and Mayoress of the City of Westminster, Dame Mary Smieton, Sir Charles Goodeve, Professor H. Ford, Sir Hamish Maclaren, Professor D. Williams, Mr. A. A. B. Harvey, Sir Gordon Sutherland, Mr. G. W. Lacey, Dr. W. G. Hiscock and Mr. R. B. F. Wylie, many of whom were accompanied by their ladies.

Jopling's Long-service Awards

On May 5 the date when Mr. R. Bonner, a moulder, achieved 50 years' service with E. Jopling & Sons, Limited, steelfounders of Sunderland, the directors invited other long-service men and their wives to a presentation dinner. During the evening 10 gold watches were given to employees with over 40 years' service, and 58 stainless-steel watches were presented to men and one lady clerk with over 25 years' service.

During his speech, Mr. C. A. Nicholson, director, pointed out that the watches to be presented represented a total 2,260 years' service, and in addition, two men who had already achieved 50 years' service with the firm were guests. For a firm with a payroll of somewhat less than 300, this was considered to be a remarkable evidence of loyalty, and one of which the management were very proud indeed. Mrs. C. A. Nicholson, assisted by Mr. G. H. Clubley (both directors) presented the watches to the men, and the evening was concluded by dancing and a cabaret which was provided by the men themselves.

Hazard of Unfenced Mould Pits

The dangers of unprotected foundry pits were stressed by Mr. G. Richardson, deputy superintending inspector of factories for Sheffield, at a meeting of the Sheffield area industrial group of the Royal Society for Prevention of Accidents, at the Grand Hotel, Sheffield. He said they were potential hazards and urged members to see what could be done "to protect these holes." He menioned a recent case of a man who was killed when an overflow mould exploded—not from flying metal but from a fractured skull through falling into a neighbouring overflow pit. Mr. J. Whelan asked that member-firms should give more support to a one-day "safety" conference in October. A film show on wire-rope manufacture concluded the meeting.

New Nickel Markets sought by INCO

Strenuous efforts to develop new markets for nickel are being made by the world's largest producer of the metal, International Nickel Company of Canada, Limited, now that its capacity is comfortably ahead of demand.

The chairman, Mr. Henry S. Wingate said in London recently that his own company's annual output would be raised by 75,000,000 lb. to 385,000,000 lb. by the end of the year—nearly two thirds of the world's total nickel capacity of some 600,000,000 lb. Although stainless steel still accounts for nearly a third of total consumption, the company hopes to expand other uses so that the demand for nickel grows faster than industrial production as a whole.

Mr. Wingate, who was in Europe to attend a marketing conference of all the company's selling agents in Holland last week, said that since the last such conference in 1956 the nickel market had been transformed from scarcity to surplus. The outstanding event had been the completion of the Thompson mine in Manitoba, which was officially opened last March.

In the UK, the company is pressing ahead with its new alloy plant at Hereford, one of the most modern in the world. It has involved an investment of some £30,000,000. At the same time the capacity of the refinery in South Wales has been expanded from 48,000,000 lb. a year to 80,000,000 lb.

Despite the lower earnings of International Nickel for the first quarter, Mr. Wingate expected those for the year as a whole to be about the same as in 1960.

Bulgarian Technology

The March, 1961, issue of the Bulgarian journal, *Mashinostroene*, contains, amongst its other items, two articles of interest to foundrymen. The first is entitled "New Method for Gravimetric Determination of Silicon in Steels and Cast Iron as blue silicomolybdatochinoline complex," by Mr. D. Filipov, and describes the method in detail. It is pointed out that unlike the method of quantitative determination of silicon as yellow silicomolybdatochinoline complex, the phosphorus, arsenic and vanadium contained in steels and cast iron do not interfere with the determination of silicon as the blue complex. The second article, by Mr. A. Bradvarov, is entitled "Possibilities of using Sands and Clays from the Districts of Vetovo, Senovo and Kaolinovo in Foundry Production." In the paper, it is established that the kaolin sands of the three deposits consist of pure quartz sand, mixed with 15 to 20 per cent. kaolin. This kaolin mixture is reported to possess good founding properties and may be used in production as a natural moulding mixture.

Foundry Supplies Exhibition

The National Trades Technical Societies, 3, Shearwood Road, Sheffield 10, announce the holding of an exhibition covering new developments of supplies and requisites for the foundry industry. It is to be held at Somme Barracks, Glossop Road, Sheffield, from November 7 to 10. It is five years since the last foundry supplies exhibition was held in Sheffield and if the success then achieved can be repeated it will be a worthwhile effort. Details of the exhibition can be obtained from Mr. W. H. Bolton at the address given above.

Soho Foundry 1796—1956

*By A. J. Shore**

Trade mark of James Watt & Company, established 1774.

The history of the Soho foundry in its association with James Watt and other pioneer engineers and founders is obviously of great interest to foundrymen at large. The Author of this article has conducted researches on the spot over a period of years which tend to modify theories previously held as to the Soho layout and the method of working adopted. These matters are thus recorded partly for the sake of posterity.

Forty years or so ago, I was an apprentice in the old Soho Foundry. Many people, from all over the world, came to visit us, and I was often chosen to take them round. Everyone knew that Soho Foundry was connected with Boulton & Watt and the steam engine, and they expected to be shown something relating to these famous men. We had, at the time, a very energetic and resourceful publicity manager and a nice line of patter about the doings of James Watt—a product of some half-remembered tales and a vivid imagination, for the most part completely inaccurate. It was, no doubt, good publicity but bad history. A favourite excursion was through the underground passages below the foundry, emerging eventually in the Pattern Stores. We used to trail the admiring visitors through dimly-lit tunnels, admonishing them in one particularly low-roofed spot to keep their heads down. When we arrived at a dungeon-like grotto we explained how James Watt was supposed to work there in fear of his life, or at any rate, of his inventions which were in danger of plunder by covetous foreigners or destruction by an infuriated mob. Further on we pointed out the entrance to a secret tunnel running up to William Murdock's house about a quarter of a mile away at Handsworth. At that time, I suppose I partly believed the things I told people, though even then I must have had my suspicions, for I made good use of such words as "probably" and "reputed."

Secrecy

As I learned more about James Watt, and found that he had retired from business soon after the start of Soho Foundry, and when I realized that between Murdock's house and the foundry cellar was a road at least 20 ft. lower than the foundry tunnel, I began to doubt in earnest. The real facts relating to the old foundry are much more thrilling to foundrymen and engineers than the melodramatic stories we used to tell. It is true a great deal of secrecy attended the early days of Soho, for at that time steam-power held the place in public imagination that nuclear-power occupies at the present day. Nevertheless, I have found that the cellars and underground passages were not formed for reasons of secrecy, as was popularly supposed. That these underground chambers have their origins in straightforward foundry planning is the story I now want to tell, for, I believe it has never before been published.

Birth of Foundry

Originally Boulton & Watt did not make steam engines. They designed them—often only making the valve gear, a very important bit of mechanical know-how. They sold the designs and extracted a royalty on every ton of coal saved while operatting their separate condenser engines, as compared with the old type. It was only when their parents began to lapse that they were forced to make complete engines, and even then they bought their castings out. So, towards the end of the 18th century the partners decided to open a new works on the heath, alongside the canal at Smethwick, devoted entirely to the manufacture of steam engines. This new works, in addition to having forge, machining and fitting shops, was to have an iron foundry. For years many of the castings for Watt's engine came from John Wilkinson's Iron Works at Broseley. "Pray tell Mr. Wilkinson," wrote Boulton to Watt on February 24, 1776, "to get a dozen cylinders cast and poured from 12- to 50-in. diameter, and as many condensers of suitable sizes." Now, however, in 1794 when the Iron Master had gone out of business the partners decided to have a foundry of their own. The importance they attached to it is evinced by the fact that the new works was called "Soho Foundry."

James Watt, now over 60 years old, was not taking a very active interest in the steam engine business, and Boulton, getting on for 70 was absorbed in his mint. The sons of the old partners, namely James Watt Jnr. and Matthew Robinson Boulton were the young men responsible for the planning and starting up of Soho Foundry, assisted by a third member of the original team, William Murdock. The older men merely acquired the site and backed the project. Matthew Boulton, when he presided over the historic Rearing Feast in 1796, described himself as the "father of Soho." The young men were the active planners, and a splendid job they made of it. H. W. Dickinson, writing in 1935 says:—

* The Author is general superintendent of foundries at W. & T. Avery, Limited, the firm operating Soho Foundry up to its closure in 1956. His own direct style has been preserved in this account in order to preserve continuity and freshness—Editor.

Soho Foundry 1796—1956

"A distinguishing feature of the Foundry was the way in which it was organized and run. There is nothing in the costing, the feeds and speeds, the scientific management of Taylor, Ford and other experts of the present day that was not to be found at Soho before 1805. This early engineering works possessed an organization that far excelled that of any other extant establishment and that can bear comparison with that of any works of the present day."

Exploration

When I first started taking an interest in the old foundry building in the 1920s, I was unaware of documentary information which has since been uncovered. I knew there was a Boulton and Watt collection, but I did not know there were any letters extant which would throw a light on the beginnings and early activities of Soho.

I believed that James Watt, of steam-engine fame, had a hand in it, but I felt he was too good an engineer to work in the dark of a cellar. In fact, the cellar was so low I could not conceive anything he could profitably do down there so I thought there must be a simpler explanation. I carefully examined the bricks and was able to determine which were the older by their slightly smaller dimensions, and by where alterations and additions had been made. With this information I was then able to trace out the original limits of the first foundry. I then made the important discovery that the underground passages were *not originally underground passages at all.* The original ground level was 11-ft. below the present one and the so-called "cellar" had been built to raise the foundry floor to the level of the canal wharf. It was strongly built and was therefore designed to support something, what, I was not quite sure, but I began to think it might be mould stoves. If this were so, the foundry floor proper would be 40 ft. wide by a little over 100 ft. long. There was a change of brick about three parts along the foundry wall so it looked as if there had been an extension later and I was not very happy that the wooden crane-track beams were part of the original scheme because the brick columns were cut back above them. There were some arches on the wall on the canal side which I

Facsimile of Report dated May 2, 1940, received from BCIRA and signed by Dr. J. G. Pearce then director.

The sample which we understand was obtained from a casting pit which had not been in use for a very long time, consisted of moulding sand, together with pieces (found by analysis to be calcium carbonate) of white material up to 1 in. diameter, and a few fragments of building brick, coal, coke and charcoal. The sand was separated as completely as possible from the remaining material.

There appeared to be two different sands present, one fairly soft and the other exceedingly hard. These were separated and milled for ten minutes with water in a small Simpson mixer, the moulding sands obtained being identical, and the difference in the hardness of the original samples due to differences in their moisture contents before drying.

The physical properties and mechanical composition of the milled sand were as follows:

Physical Properties.

Moisture	4.8 per cent.
Permeability No.	16
Green compression	10.5 lb./sq. in.
Dry compression	137 lb./sq.in.

Mechanical Composition.

(a) By Elutriation		*(b) By Sedimentation and Sieving*	
Clay %	8.6	Clay %	9.8
Fine Silt % ..	6.6	−300 mesh % ..	7.6
Coarse Silt % ..	18.1	+300 mesh % ..	7.6
Fine Sand % ..	51.3	+200 mesh % ..	15.9
Medium Sand %	14.7	+150 mesh % ..	26.2
Coarse Sand %	0.7	+100 mesh % ..	22.2
		+ 60 mesh % ..	7.9
		+ 44 mesh % ..	1.9
		+ 30 mesh % ..	0.8
		+ 22 mesh % ..	0.1

The sand is a red Bunter sand similar to that from the deposits at Sand pits and Hockley which are now no longer worked. The sample was contaminated with a large amount of impurities which had never formed a part of the original moulding mixture, and also contained small quantities of finely divided carbonaceous matter which may have been present in the original sand or may have been derived from accidental inclusions.

Owing to the time which has elapsed since the sand was last used, the following conclusions, drawn after examination of the bulk sample, can only be accepted as possible.

(1) The difference between the hardness of the two types of sand aggregate can only be explained by a difference in the original moisture content as their mechanical analyses and physical properties after milling are the same. A mixture of this type would be found if the sand had been used for a greensand mould with a loam core, although it is possible that percolation of water into part of the sand might produce a similar result.

(2) Fragments of charcoal up to ½ in. diameter were embedded in two of the hard fragments, and charcoal may have been used in the centre of the cores.

(3) The strength of the sand is high in relation to the proportion of sand grade present, and the material could be used for moulding now if the various impurities were removed.

(4) The sand is darker than new red sands, but is not black. It does not appear that coal dust was normally used in the sand as heating for long enough to produce a sand as light in colour from a mixture containing coal dust would have resulted in a greater loss in strength.

(5) A small amount of carbonaceous matter, probably charcoal dust, is present. This may have been derived from a core wash, or from the charcoal presumed to have been used for opening up the centres of cores.

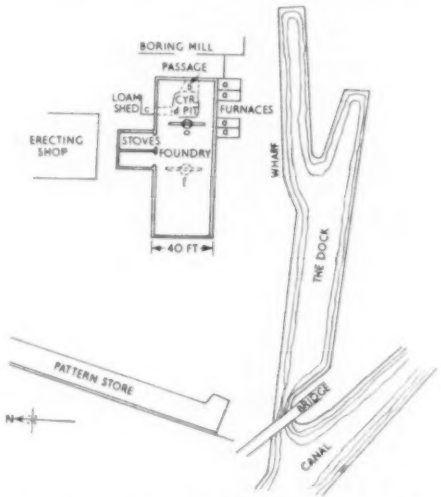

FIG. 1.—*Plan of the original foundry at Soho based on site evidence and notes of a meeting in September, 1795, between James Watt, Junr., Gilbert Gilpin and Abraham Story, the first foundry manager.*

thought might show where melting furnaces had been and as this was the canal side and the canal was the principal means of transport in those days, from the materials-handling point of view, it seemed logical to have the furnaces nearest their source of supply.

Discovery

A roughly circular pit with curved walls at one side of the later foundry warehouse and various arched passages puzzled me, but an adjacent room with walls heavily encrusted with whitewash convinced me that this was where the castings were despatched and that the room had served as an office. There was a current tradition that near this spot had been the boring mill and that the cylinder castings were rolled out of the foundry and into the boring mill. The true explanation of this pit came to light when we decided to install a jolt moulding machine there, at the beginning of the war, to make mine-sinker bases. I thought it would save excavation but we had to run in 80 tons of concrete before we could get a solid foundation. In actual fact, this was James Watt Junior's cylinder-casting pit and in the bottom, to my delight, I found the cast iron bottom bearing of the loam sweep. I put this bearing in my office, but unfortunately it was blown up in the second blitz. I sent a sample of sand that we found there to the British Cast Iron Research Association and Dr. Pearce identified it (May, 1940) as a red Bunter sand coming from the sand pits at Hockley (see page 664). Not far from the pit on a wall in the warehouse is an obviously ancient cast iron bracket secured by a square nut (not hexagonal) which I took to be part of the boring machinery. Nearby, the roof was formed of cast iron plates rather than brick-vaulted, like the rest of the "cellar" which made me think that the room at this point had previously been higher, probably accommodating a steam engine. A narrow passage from the pit baffled me and I could find no rational explanation, especially as one end of it appeared to have been bricked up at an early date and led nowhere. It was obviously too narrow to take a steam engine cylinder, but its purpose was evidently important enough to warrant very heavy brick construction supporting the weight of the foundry above.

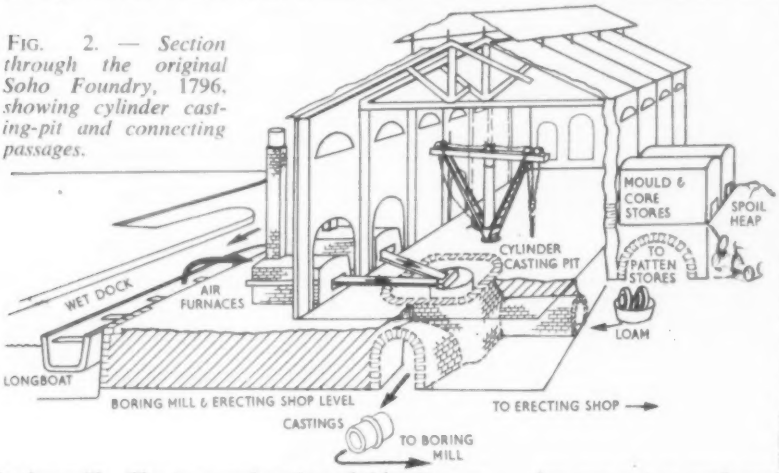

FIG. 2. — *Section through the original Soho Foundry, 1796, showing cylinder casting-pit and connecting passages.*

Early Documents

I now started searching literature to see what I could find out. I turned up Joshua Field's diary of a tour in 1821 through the Midlands, and dug out the following:—

"The foundry is a large and rather-dark building having 3 double wood cranes along the middle with about as many air furnaces placed rather outside the building having their tapping and dipping holes inside large doors in the wall between these furnaces, so stoking is outside the foundry. The cupolas are at one end blown by a cylinder worked by an engine of app. 20 horses power of the old construction. This engine also works various machinery grinding etc.—there are 4 or 5 boring bars and each is worked by a small bellcrank engine except the large one which is I believe worked by the large engine but as that bar was not at work could not see. In one room the cylinders of 4 Engines of app. 4 horse each stand close together coming app. 2-ft. through an iron floor. Underneath they each work a fly wheel by lathes; the man at the bar stops the engine to stop the bar. These engines have neither air pumps (n)or condensers (except one of them which is now cast off) but have an induction pipe leading to the condenser of the great Engine and so are necessarily dependent upon it but one having an air pump that can be attached they can work without the large one."

This confirmed the position of the melting furnaces, mentioned a cupola I did not know of, and rather confirmed the boring position and explained the iron roof (or floor). It also confirmed that the wooden beams along the wall were not in the original scheme. The first cranes were not overhead travelling cranes, they were T cranes. A successor to these cranes was still existing in the yard at the end of the main drive in my apprentice days.

The real plum of the investigation came in 1946. Mr. W. K. V. Gale, well known for his researches

FIG. 3.—*Yard at the Soho Foundry showing the three T cranes. Part of one crane can be seen on the extreme left of the foreground. The third one may just be discerned beyond the crane in full view.*

into industrial history and a member of the Newcomen Society, found a letter from James Watt Jnr. to his father dated September 24, 1795, recording an after dinner meeting he had with Gilbert Gilpin and Abraham Story, together with a small sketch (Fig. 1) showing how they intended to lay out the new foundry. It is a model basic specification and would survive the test of any modern work study. The relevant portion of the letter is as follows:—

"After dinner we had a further (*faded*) upon our intended one, at which Gilbert Gilpin and Abraham Story assisted. I sketched down the results as under, a, a, a, a, are four air furnaces, situated as near together as the men can work the fires for the conveniency of running from all four into the Cyl^{r} pit (*d*), which is placed as near to them as possible to prevent the metal cooling. By this means it is removed 10 ft. from the end of the foundry but a passage of 10 ft. wide, arched over is to be left at (*b*) to convey the cylinders into the boring mill. The building is to be 80 ft. long by 40 ft. wide. The stoves will be placed upon the opposite side to the air furnaces in order to leave the end of the foundry (*f*) entirely for castings in greensand which should not be mixed with the dry sand, which will be managed in the middle part of the building. There will be two cranes, one at (*o*); the other not yet determined upon. Additional air furnaces may if wanted be built along the wharf side, as represented by the dotted lines. A shed will be carried from the roof upon the side where the stoves are and the space under it appropriated to mixing up loam, &c., which may be conveyed into the cylinder pit by the passage (*c*)."

It thus confirms all the ideas we had and explains the one outstanding riddle; the passage we could not understand was to convey loam from the mill to the casting pit.

Reconstructed Layout

The picture is now like this:—A wet dock was to be constructed (Fig. 2) alongside the Birmingham to Wolverhampton canal "for four boats to lie," the foundry floor at the same level as the wharf. There were to be melting furnaces at the wharf side and stoves on the opposite side supported by what we now call the cellar. On lower ground a boring mill was to be erected. At the boring-mill end of the foundry was a casting pit connected by a passage to the boring mill. As the boring-mill level was about 11 ft. lower than the foundry

floor, this passage was near the bottom of the pit and so after pouring, it was an easy matter to jack the castings out into the boring mill. There was no need for a ladle and crane for pouring as the furnaces connected directly to the top of the casting pit by means of launders or channels daubed with clay. Every foundry makes a good deal of spoil, *i.e.*, burnt sand, slag, ashes, etc., and this was tipped on to the lower land on the opposite side from the canal. The old Avery foundry was built entirely on James Watt's spoil and the practice continued to form the foundry bank which in places must be 30 ft. above the original ground level. Tipping survived until the last war. I suppose the most recent occasion was after the "blitz" when the lower car-park was raised about

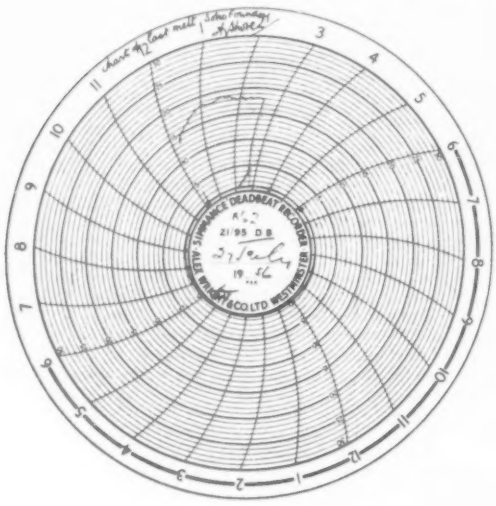

FIG. 4.—*Chart of the last melt of the Soho Foundry cupola July* 27, 1956.

18 in. with the works debris. Now this tipping explained the final mystery, that of the underground passage to Murdock's house. It now seems pretty certain that the cellar supported the mould drying stoves but it also formed a free passage to the pattern stores without any interference from tipping. The arches of the old pattern store, or maybe Watt's new pattern store, still exist well below the present foundry level. The "underground passage" which appeared to have been blocked up, merely led into the open air and got blocked up when the tipping reached as far as its entrance. It is just possible, however, that there was somewhere a connecting culvert between the Soho Foundry and Murdock's house, not for secret communications, but in which to carry his gas pipes!

Unanswered Question

There are still a number of unexplained features, for instance, there is a cast iron frame with hinge lugs intact, in the wall of the loam passage. The opening it formerly surrounded was bricked up probably 100 years ago. From its position it was possibly the entrance to a culvert leading from the blowing engine to a cupola. When I was a youth, an old man told me that when *he* was a youth he had crawled along a passage from the warehouse which was supposed to lead to the cupola. I first thought this exploit supported my theory, but turning to a plan of the "cellars" 1916 I found a passage, well to the left of the casting pit, marked "to cubilots." The bricked-up entrance can be seen in the wall of Millwrights stores. It is partly in a very old wall and partly in an oldish wall. The bricking up is much later. I suppose, therefore, this must be the culvert my friend referred to and it probably led to J. Watt & Company's cupolas say 100 years ago. The culvert in the loam passage I think connected with Boulton & Watt's cupola say 160 years ago.

And now a word about the T cranes that were so long a feature of Soho. A correspondent of *The Engineer* visiting in 1869 relates:—

> "The foundry and fitting shops are proportionally extensive. In the former, I was struck by the somewhat singular appearance of the cranes, all of which are constructed of wood. One of them, a perfect monster, known at Soho as 'The Elephant' was designed early in the century by Peter Ewart, an engineer in the Government Works at Woolwich, who achieved some celebrity in his day."

The illustration (Fig. 3) taken round about this time, when the foundry was 75 or 80 years old, shows three of these T cranes in the yard. The building at the right of the picture is the foundry. The chimneys of the air furnaces are prominent but there is no certain evidence of the cupola, unless the mass behind the hanging chains, is the brick stack of an early type. On the left is the old pattern shop and behind the central crane can just be discerned a canal boat in the Wet Dock—the original line of communication with the Soho Manufactury. The fall in level from the canal to the rest of the works is plainly indicated.

Anecdote

As the last foundry manager at Soho, perhaps I may, with all sympathy, relate a tale about the first, Abraham Storey. Evidently the first castings produced in the new foundry were not all that could be desired, for after the plant had been running for about three years, Abraham Storey and William Murdock went up to Leeds to see the works of the celebrated engineer William Murray. M. R. Boulton, from Soho, reported to James Watt Jnr. in London, on January 17, 1799:—

> "... Murdock and Abraham are now returned from their excursion highly delighted and full of panegyricks upon Murray's excellent work. Abraham is now entirely convinced of his inferiority, and what is more, of the possibility of amendment and he is now actually making trials of different substances to mix with the sand with the view of giving a better skin to

the castings. We have likewise written to G. McMurdock to send a boat load of the sand used by Murray. . . ."

(G. McMurdock should be McMurdo.)

There is a sad sequel to this letter, for M. R. Boulton, writing again on February 1, 1799 says:—

". . . I cannot, however, altogether suppress the pleasure of announcing to you a most promising alteration in the spirit of our forgers and the appearance of their work. . . . No improvement, however, in the foundry work—Abraham full of excuses."

Soho Foundry was opened with great ceremony and jollification on January 30, 1796, and as the record chart (Fig. 4) testifies, the wind was taken out of the cupolas for the last time at 2.38 p.m., Friday, July 27, 1956.

Acknowledgment

The Author wishes to acknowledge the kind permission of the directors of W. & T. Avery, Limited, to publish this study.

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Ceramic Industries Recruitment Conference

An important conference on the problems of recruitment and training for the ceramic industries was held at the College of Ceramics, North Staffordshire College of Technology, on May 4. There was an attendance of approximately 70 delegates, representing all the major sections of the industry.

Mr. G. N. Hodson, president of the Institute of Ceramics, emphasised that the future of the industry might well depend on the reaction of the delegates to the proposals for the future training of managers and technologists. The industry, he said, must be prepared to accept the challenge to maintain its standards in the face of the competition from newer, and, in some cases, more glamorous industries. The annual turnover of the industry was £150,000,000 to £200,000,000 and about 150,000 people were employed. New ideas and inventions were opening up new fields of activity, and such an industry must not be allowed to die. The College, he concluded, had a fine tradition and was able and willing to put on a course leading to a Diploma in Technology, if the industry wanted it.

Dr. W. L. German, head of the College of Ceramics, said the main function of the conference was to consider the implication of applying for permission to run a Dip. Tech. course in ceramics. Broadly speaking the curriculum would have to include basic science—chemistry, mathematics, and physics—and fuel and ceramic technology, with some liberal studies. It would be a four year sandwich course. Entry would be either from school, with two appropriate subjects at "A" level, or by means of a good O.N.C. in chemistry or applied physics, or some equivalent qualification.

The Ministry of Education would require assurances of the support of industry through the sending of industry-based trainees, by provision of works training facilities for college-based students, with local education authority grants, or by the provision of scholarships. Some firms had already promised help in some of these ways. He hoped that the meeting would give its support to the scheme, for the issue could not be shelved much longer. At the present time the industry was spending approximately £160,000 per annum on research: through the lack of trained technologists he doubted if the full value of this was being obtained, and unless this situation was remedied things would get steadily worse.

Exports

Mr. R. Spencer C. Copeland (managing director, W. T. Copeland & Sons, Limited) commented on the fact that approximately one quarter of the turnover of the industry was due to china and earthenware, and that much of this went for export. In his view it was obvious that the industry was not attracting sufficient numbers of the right type of person. He went on to say that this industry should offer a nationally-recognized course in further education, such as the Dip. Tech. The industry, by offering better pay and conditions, must recruit suitable young men for this course. They had to take a broader view of the scope of the industry in modern times and to demonstrate to young men that with a Dip. Tech. qualification they were not restricted to one branch of the industry. If this were done there should be no difficulty in getting recruits. A revolution in the quality of new entrants to the industry would quickly be reflected in improved quality and efficiency of production. Now was the time to do this if the UK was not to be left behind in the technological race in which other countries, such as the USA, Germany, and Japan, had already made a good start.

Science-based Industry

Dr. N. F. Astbury, director of the British Ceramic Research Association, said that the ceramic industry was in process of changing from a craft-based industry to one based on science. That being so it could well learn from those newer science-based industries the nature of the problems to be faced, and how they could be tackled. Ceramics was one of the fringe fields of applied science in which the Diploma in Technology could make its most potent contribution. First, it was of immense significance to the young man or woman of to-day who was planning a career that the Dip. Tech. was a "technological award of high standing having a national currency." Second, courses leading to the Diploma in Technology were equivalent in standard to honours degree courses of a British university, and third, the course was full-time, with sandwich periods in industry. Industry and the technical colleges thus became partners, who, together with the local authority, constituted very nearly an irresistible force.

Summarizing the discussion, the chairman said that the College was willing to provide such a course if there was sufficient support. The cost was not a high one to pay for survival. He then moved the resolution that "This conference recommends that application be made for approval of a course leading to a Dip. Tech.," which was seconded by Mr. B. R. G. Rowley (assistant controller of Education, English Electric Company). The resolution was carried without dissent.

Notes from the Branches

Tees-side

The annual apprenticeship competition, started in 1953 by the Tees-side branch of the Institute of British Foundrymen, has become of national importance said Mr. Charles Wilson, IBF past-president and a director of the Stanton Ironworks Company, Limited, at this year's presentation of awards to competitors at Head Wrightson's Teesdale Hall, Thornaby-on-Tees, last month. Mr. Wilson added that the competition had been very effective in raising the standard of craftsmanship in the area's foundry industry. In recent years, other branches of the Institute had established competitions in their own areas, and the Tees-side branch had been able to help them with advice based on long experience.

Mr. A. P. Riley, works manager of the Darlington Forge, Limited, and chairman of the competition committee, reported that the total number of entries was down on last year; he thought that possibly this was due to firms being unwilling to enter exhibits because of the high standard of work submitted, in fact, the overall standard of work had gone up. Awards were presented as shown in Table 1.

The adjudicators for the entries in the practical sections, which had been previously judged at the Darlington Forge, Limited, were:—*Steel-moulding section:* Mr. R. Horton, Samuel Osborn & Company, Limited, and Mr. R. Wright, English Steel Castings Corporation, Limited. *Iron-moulding section*: Mr. D. Kershaw, Modern Foundries, Limited, and Mr. D. Hickman, Cochranes (Middlesbro') Foundry, Limited. *Non-ferrous Moulding*: Mr. C. Timms, British Engines, Limited, and *Wood Patternmaking*, Mr. L. Brown, Premo Patternmaking Company, Limited.

The written paper sections, under 21 and 21 to 28 years, were judged respectively by Mr. J. Currie, Blackett Hutton & Company, Limited, and Mr. J. Bamford, head of the National Foundry College.

TABLE 1.—*IBF Tees-side Branch* 1961 *Apprentice Competition Results.*

Place.	Name.	Firm.	Prize or award.
			£ s. d.
Wood Patternmaking			
1st	R. Nicholls ..	Richardsons Westgarth Ltd. ..	5 5 0
2nd	I. Lawther ..	Northgate Patternmaking Co.	3 3 0
3rd	M. Dunn ..	Richardsons Westgarth Ltd. ..	1 1 0
4th	H. Wilson ..	Seal Engineering Ltd. ..	Certificate
Steel Moulding			
1st	E. Peacock ..	Head Wrightson Steel Foundries Ltd.	5 5 0
2nd	A. Elliott ..	Darlington Forge Ltd. ..	2 2 0
2nd	H. Umpleby ..	Head Wrightson Steel Foundries Ltd.	2 2 0
3rd	K. Stephenson ..	Wolsingham Steel Co., Ltd. ..	Certificate
4th	C. Gibson ..	Wolsingham Steel Co., Ltd. ..	Certificate
Cast-iron Moulding			
1st	F. Sexton ..	Stockton Castings Co., Ltd. ..	5 5 0
2nd	K. Jeavons ..	Daralum Castings, Ltd. ..	3 3 0
3rd	C. R. Taylor ..	Newgate Foundry, Ltd. ..	1 1 0
4th	J. P. Searle ..	Newgate Foundry, Ltd. ..	Certificate
Non-ferrous Moulding			
1st	K. Jeavons ..	Daralum Castings, Ltd. ..	5 5 0
2nd	R. Parkins ..	John Vickers & Sons Ltd. ..	3 3 0
3rd	J. Mulloy ..	John Vickers & Sons Ltd. ..	Certificate
Written Papers (under 21)			
1st	T. Eyeington ..	W. Shaw & Co. Ltd.	5 5 0
2nd	M. Dunn ..	Richardsons Westgarth Ltd. ..	3 3 0
3rd	B. Bird	Blackett Hutton & Co. Ltd. ..	1 1 0
Written Papers (aged 21-28)			
1st	F. Allinson ..	W. Shaw & Co. Ltd.	5 5 0
2nd	W. Kallagher ..	Head Wrightsons Co. Ltd. ..	3 3 0
3rd	D. Craig ..	The Darlington Forge Ltd. ..	1 1 0

The number of firms taking part this year totalled 26, and apprentices from 14 of these were prizewinners. Entries for the various sections were as follow:—Steel, 41; Iron, 43; Wood patternmaking, 27; Non-ferrous, 10; Written paper (under 21), 9; Written paper (21/28) 12.

In addition to Mr. Riley the Apprentice Competition Committee was comprised of Mr. D. Forster, Darlington Forge Limited, who acted as secretary; Mr. J. Horton, Wolsingham Steel Company, Limited; Mr. T.

Mr. C. H. Wilson, past-president of the Institute of British Foundrymen (second right), presenting a certificate to Mr. E. Peacock, who won first prize in the steel-moulding section of the competition. watched by Mr. F. Potts, branch president (centre), and several other prizewinners.

One of the adjudicators, Mr. L. Brown (left), and Mr. A. P. Riley, chairman of the Competition Committee, inspecting a wood pattern.

Hurst, Stockton Castings, Limited; Mr. G. Stanley, Cochranes, Limited, and Mr. G. Taylor, Head Wrightson, Limited.

Prior to the presentations the branch held its annual general meeting at which Mr. T. Hurst was elected president, Mr. G. F. Taylor, senior vice-president, and Mr. P. Ridsdale, junior vice-president.

East Midlands

The annual dinner/dance of the IBF East Midlands branch was held at the Portland Building in the lovely setting of Nottingham University grounds. The branch president, Mr. W. L. Beresford, presided over a gathering of approximately 200 members and guests, and the occasion was graced by the then national president, Mr. G. R. Shotton, and Mrs. Shotton.

The toast to the East Midlands branch was proposed by Mr. Shotton in his usual engaging manner to which the branch president replied. Mr. G. W. Fearfield, senior vice-president, proposed the toast to the guests to which a most witty reply was made by Mr. N. C. Macdiarmid, managing director of Stanton Ironworks Company, Limited. Amongst the guests were Mr. C. H. Wilson, then immediate past-president of the IBF, Mr. G. Lambert, secretary, and Mr. G. R. Buckley, deputy managing director, Mr. E. H. Summers, director, and Mr. L. Hearnshaw, general manager, foundries, of Stanton Ironworks, all of whom were accompanied by their ladies. Also present was Mr. A. F. Simpkin, principal of the Ilkeston College of Further Education.

Once again Mr. W. H. Smith officiated as master of ceremonies and toastmaster and the arrangements reflect great credit on the sub-committee formed for this function, and in particular to Mr. G. Brown who acted as secretary.

Slough Section

The social gathering of the Slough section was on Saturday, April 29, when a party of members and their wives, including the president, Mr. H. J. Proffitt and Mrs. Proffitt, journeyed to London by coach for the early performance of the "Life of Susie Wong" at the

Scenes at the IBF East Midlands branch dinner/dance last month. From left to right are Mrs. Shotton, Mr. G. R. Shotton (IBF president), Mrs. Beresford, Mr. W. L. Beresford (branch president), and, in the second section, Mr. N. C. Macdiarmid (managing director, Stanton Ironworks Company, Limited), Mr. C. S. Whitfield (Stanton Ironworks, Holwell), Mrs. Macdiarmid, Mr. G. W. Fearfield (branch senior vice-president), proposing the toast to the guests, and Mrs. Fearfield.

Prince of Wales Theatre. Afterwards, the whole party travelled to Egham in Surrey for a dinner/dance at the Great Foster's Hotel, a converted mediaeval mansion. Also amongst the party were the president of the London branch, Mr. D. A. C. Hutchison, the secretary, Mr. A. R. Parkes, and Mr. T. Wills, assistant secretary, accompanied by their wives, and making up a total of 24 with the Slough party, for a very successful evening. The arrangements were handled by the section secretary, Mr. R. J. Bown, and all went according to plan.

Newcastle-upon-Tyne

In the examination for the junior section of the John Surtees Memorial Competition of the Newcastle-upon-Tyne branch, which took place in March, the winner of the medal and first prize was Mr. Angus Morrison Morris, the second prizewinner was Mr. Thomas Trotter, and the third prize went to Mr. Robert Foster. The awards were made at the branch annual meeting on April 8.

The examination followed the usual lines comprising both practical and written tests, the judges for the practical section being Mr. J. G. Dodds and Mr. A. M. Burton, and for the written tests, Mr. N. Charlton and Mr. J. T. Fletcher. The branch acknowledges its debt to C. A. Parsons & Company, Limited, of Newcastle, and to E. N. Mackley & Company, Limited, Gateshead, for their generous assistance in once again allowing the examination to be held in their works.

South Africa

The third annual conference of the South African branch was held in Queen's Hall, Johannesburg, on April 20. At the morning session the conference heard the exchange paper from India by Mr. A. V. Kulkarni on "Cupola Practice in an Indian Foundry," and a second paper, by Mr. B. J. Lombard, entitled "Practical Aspects of Stockyard and Cupola Control." The paper presented at the afternoon session was by Mr. J. L. Handley who dealt with "Practical Applications of the CO_2 Process."

Film Reviews

By courtesy of the Central Office of Information and the Council of Ironfoundry Associations, the writer was privileged to attend showings recently of two foundry films from abroad:

The first, a 16-mm. silent, colour film, running time 23 min. (with sub-titles in German), was produced for Gebr. Hüttenes KG of Düsseldorf and is distributed through the German Productivity Association *Rationalisierungs Kuratorium der Deutschen Wirtschaft* (RKW), of Frankfurt on Maine. It deals with the development of a foam/slag trap for incorporation in the running systems of moulds and also the experimental development of running systems by means of water flow through glass models. Initially, sequences illustrate the effect of water (metal) level and outlet size in the various components of a running system incorporating an open dross trap and thereafter models are shown where gas and slag (the latter, simulated by cork particles) are introduced into the system. The whole is a good example of how flow techniques can be water simulated in this way, but one is left with the thought that the subject is more suited to a demonstration table than to filming, although the addition of a spoken commentary to the film might represent a great improvement.

The second film was made for the *Syndicat Général des Fondeurs de France* (French Foundry Employers' Association) and is a 35-mm. colour film entitled "Art —Science and Foundry." Its running time is approximately 40 minutes and there is a sound commentary throughout, in French. The film makes excellent propaganda for the French foundry industry by taking the viewer on tours of foundries. This is accomplished by conducting one of the characters of the film, a comparative layman, Mr. Thomas, on visits to foundry shops, etc., accompanied by a Mr. Lefevre, a foundry manager. The idea is that Mr. Thomas has been attached to the research department of the large works and will need to specialize in the development of new applications for castings. In addition to jobbing and mechanized founding, art founding, bell founding and the Paris Foundry High School are dealt with in turn, including surveys of the whole gamut of control and production operations and, finally, shots of the central laboratory near Paris of the *Centre Technique des Industries de la Fonderie*. As an epilogue, Mr. Lefevre, back in his ordinary life, shows his increased awareness of the part castings play in everyone's existence at home and out of doors. The reviewer compliments those responsible for the production of the film on the excellence of the photography both in and out of the foundries and the way in which sequences are beautifully dovetailed throughout.

Fair Oriana: produced by Wallace Productions, Limited, for United Steel Companies, Limited, The Mount, Broomhill, Sheffield, 10; 35-mm. and 16-mm. copies in Eastman colour; running time 28 min.

This film which had its premiere in London on April 24 is a colour documentary on the building, launching, equipping and sailing of the new 42,000-ton Orient-line passenger-ship, T.S.S. Oriana. The ship was built at the Barrow yards of Vickers-Armstrongs (Shipbuilders), Limited, and thus is the largest to be built in England. The film includes some spectacular shots of the launching of the Oriana by H.R.H. Princess Alexandra in November, 1959, and then viewers are taken on a tour of part of the ship with attention particularly drawn to the applications of steel forgings, stainless steel in the galleys and for cutlery, pipework, ventilation ducts, etc. These are all linked with views of steel production in the various shops of companies in the United Steel group, notably Appleby-Frodingham Steel Company and Steel, Peech & Tozer. For the closing sequence, a dramatic switch is made from colour to black and white to show the start of the Oriana's maiden voyage, as it appeared on the ship's own closed-circuit television, up to the time when she "dropped her pilot" in the gathering dusk, *en route* for Australia.

So seldom are the end-uses of steel adequately coupled with the production processes that this film in doing just that in superlative manner makes it an outstanding documentary of the year.

Firth Rolling Mill at Durgapur

The last of the five rolling mills to be provided under the ISCON contract at Durgapur—the continuous merchant mill—was commissioned on April 27 and is now ready to go into production. The mill was designed by the Morgan Construction Company, Limited, and supplied and installed by Davy and United Engineering Company, Limited, a member company of ISCON. With the exception of the wheel and axle plant, which will come into operation in a few months' time, the steelworks are now completed. Many sections of the £120,000,000 steel plant have been put into operation well ahead of the schedule date.

Personal

Mr. H. BINKS has retired from the board of Amal Limited, Witton, Birmingham, a subsidiary of Imperial Chemical Industries, Limited.

Mr. R. A. DUFF has been appointed managing director of Samuel Taylor & Sons (Brierley Hill), Limited, manufacturers of anchors and chain cables, Brierley Hill.

Mr. O. F. GRAZEBROOK and Mr. JAMES TENNANT have been appointed joint honorary presidents of British Rollmakers Corporation, Limited, on retiring from the board.

Mr. FREDERICK G. DANNING has been appointed to the newly-created post of director of export sales of Pyramid Instrument Corporation, Lynbrook, Long Island, New York.

Mr. JACK PHILLIPS, managing director of Phillips Trawl Products, Limited, has been appointed to the board of Harper Phillips & Company, Limited, Albion Foundry, Eastgate, Grimsby.

Mr. G. W. WRIGHT, Mr. J. BLAKISTON and Mr. M. WOOD have been elected to the board of Ormerod Shapers, Limited, Hebden Bridge, a subsidiary of the Asquith Tool Corporation, Limited.

At the annual meeting of the Light Metal Founders' Association, Mr. W. BROWN retired from the chair and Mr. L. R. CARR, M.P., of John Dale, Limited was elected chairman for the ensuing year.

Mr. A. W. E. HOUGHTON has been appointed assistant managing director, and Sir GEOFFREY TUTTLE, general manager, of Vickers-Armstrongs (Aircraft), Limited, a British Aircraft Corporation company.

Sir RONALD L. PRAIN, chairman of the Rhodesian Selection Trust Group, has been appointed chairman of the Commonwealth Council of Mining and Metallurgical Institutions, in succession to LORD BAILLIEU.

Mr. CLIFFORD S. SHAW, M.I.MECH.E., has been appointed assistant managing director of R. H. Neal & Company, Limited, of Grantham, one of the Steel Group of Companies. Mr. Shaw is returning to Neals after 23 years with K & L Steelfounders & Engineers, Limited, 16 as technical director.

LORD HAILSHAM, the Minister for Science, is to open INTERPLAS 61 at Olympia, London, at 12 noon on June 21. After the opening ceremony the Minister will make a tour of the exhibition. INTERPLAS 61, the sixth International Plastics Exhibition and Convention, takes place from June 21 to July 1.

Mr. G. T. HARRIS who has been appointed assistant managing director of Jessop-Saville, Limited, Sheffield, a member of the BSA group of companies, has been with the Jessop-Saville organization for more than 20 years. Mr. J. G. RYDER, who recently joined the company to take charge of production, has been appointed to the board.

Mr. H. H. MUMBY, a director of Thos. W. Ward, Limited, Sheffield, has been elected president of the British Shipbreakers' Association. He has directed the activities of Thos. W. Ward in their shipbreaking and non-ferrous metal departments for a number of years. Mr. Mumby is also a director of the Alexander Metal Company, Limited.

Mr. R. F. MARSHALL has been appointed central education officer of Associated Electrical Industries, Limited, in London. He is succeeded as education officer at Manchester by Mr. B. DAWKINS. Mr. R. S. GILLING has been appointed manager of AEI's military and marine radar works, Leicester, a part of the electronic apparatus division.

Miss MARGARET FELSTEAD and Mr. KEITH DAWS, employees of Stanton Ironworks Company, Limited, near Nottingham, went to Buckingham Palace last week to receive their Gold Standard Awards from H.R.H. the Duke of Edinburgh. Twenty-one other young Stanton employees have already received Gold Standards from Prince Philip.

Mr. K. C. TURNER, managing director of General Industrial Cleaners, Limited, Borrowash, Derby, has been appointed president of the Traders' Road Transport Association, the national body for firms using commercial vehicles under a C licence. He succeeds Mr. S. C. BOND, C.B.E., who has relinquished the presidency after seven years in office.

Sir EDWIN HERBERT has been reappointed president of the Electrical Development Association for 1961-1962. Mr. R. R. B. BROWN, chairman, Southern Electricity Board, has been elected chairman of the Council for the current year in succession to Mr. D. B. IRVING, chairman, London Electricity Board. Mr. D. H. KENDON, chairman, Merseyside and North Wales Electricity Board, has been elected vice-chairman of the Council.

Mr. JAMES HALE who has been works manager with Robert W. Coan, Limited, Duncan Street, Islington, London, N.1, for 29 years retired at the end of April, but is being retained in a consultative capacity. He was the recipient of a number of presents at a luncheon held in his honour on May 6. Mr. Hale has been engaged in the aluminium foundry industry for about 43 years. He joined the Institute of British Foundrymen in 1944.

Mr. J. C. MILNE who has been elected president of the Wolverhampton Chamber of Commerce after having been senior vice-president for two years, is chairman and managing director of Tyseley Foundry, Limited, an associate of the Electric Construction Company, Limited, Wolverhampton, of which he is also chairman and managing director. He is chairman of the Wolverhampton District Advisory Committee of the Midland Regional Board for Industry and a member of the British Productivity Council.

Lord ROTHSCHILD has been appointed vice-chairman of research of the Shell organization. He will continue as scientific adviser to the company and will become principal representative in matters relating to academic, government and private research in Britain when Dr. C. G. WILLIAMS, general manager, retires in October. He has been a director of BOAC and of the Overseas Food Corporation and was a member of the BBC General Advisory Council, and chairman of the Agricultural Research Council from 1948 to 1958.

Mr. CHARLES H. CRABTREE, head of R. W. Crabtree & Sons, Limited, printing-machine manufacturers and engineers, Leeds, has retired from the joint managing directorship of the firm, but continues as chairman. He is now aged 80 and has been managing director for some 40 years. Mr. PETER N. CRABTREE, who has been a joint managing director for 13 years, will be joined by Mr. A. RAYNER, financial director. Mr. HAROLD M. TAYLOR, a director since 1936, has retired through ill-health. Mr. H. E. BIRKINSHAW, secretary has been appointed a director, while remaining as secretary. Other directors appointed are Mr. J. M. LOUGEE, who has been for 25 years with R. Hoe & Company, Limited, London, which was acquired by Crabtree & Sons in 1938, and Mr. A. BAIN, who has been in charge of the Bren Division, since that company was taken over in 1954.

American Letter

US Statistics for 1960

The overall US castings tonnage output for 1960 finished for the most part about "neck and neck" with 1959. The comparison contains the depressing effect of the steel strike during the second half of 1959 which was balanced by extra activity early 1960, followed by a subsequent slump. From the statistics available, some indication of changing trends in the use of castings is discernible. The ability for the output of various casting products to stand fast is quite remarkable in the face of intense competition and lessened demand.

Taking first grey-iron castings, the overall tonnage which approximately matched the output for 1959, showed that pressure-pipe and soil-pipe relaxed by 7 to 10 per cent. respectively, indicating a recession in US building construction activities. Ingot moulds remained steady and engineering castings declined about 7 per cent., due mainly to a recession in the automobile and machine-tool activities. The outstanding feature of the statistics is shown in the steady demand for spheroidal-graphite iron which, in terms of the overall decline, might be considered to be a counterbalanced improvement of 7 to 10 per cent. in acceptance. A depressing statistic appears in a substantial decrease in railway-car wheel production, representing about 30 per cent. decline—for 1959, an output of 300,000 tons of wheels decreased in 1960 to 200,000 short tons.

Steel castings held firmly against the recession, indicating that some additional strength in this product can be expected. The increase of 100,000 tons in 1960, most of which is attributed to railway castings, might very well consist of car-wheel business which the grey-iron wheel manufacturers lost in equal amount.

Malleable castings were off about 8 per cent. of their total tonnage and the percentage increased substantially when measured against the production of regular malleable in which product practically all of the decrease occurred. Pearlitic malleable maintained its 1959 consumption rate, indicating a further increase in its acceptance and pointing to the favourable impression which engineering trades exert towards the higher strength which pearlitic malleable provides.

Aluminium castings did fairly well for 1960 with only a 4 to 4½ per cent. decrease in consumption whilst, in contrast, magnesium castings lost about 40 per cent. of their production, which, however, is not very large because the total quantity of magnesium castings is less than 5 per cent. of the total for aluminium. It is quite likely that aluminium castings picked up some of the magnesium market. Zinc-base die-castings also maintained a good standing, indicating that their use in industry is increasing. The poorest figures came from copper-base castings, which declined approximately 15 per cent. in tonnage compared with the production for 1959, and the decrease extended for sand as well as permanent-mould products. The steady decline in the use of copper-base castings may be stemmed or actually reversed if proposed plans to promote research in the US copper field materializes.

In conclusion, the record for 1960 presents a brighter statement by its statistical facts than the gloomy predictions and comments upon business conditions did during the second half of 1960. Having survived the depressing news of late 1960, the prospects for 1961 seem encouraging, although no startling changes have developed in activities to date.

Non-ferrous Melting and Founding Regulations

Requirements for the protection of workers engaged in the melting or founding of non-ferrous metals are proposed in the revised preliminary draft of the Non-ferrous Metals (Melting and Founding) Regulations issued last week by the Ministry of Labour. These Regulations are based on the report of the Joint Standing Committee on Safety, Health and Welfare Conditions in Non-ferrous Foundries.

The text now issued has been prepared in the light of the numerous observations received and of consultations held with organizations of employers, workers and other interested parties. The major change has been the inclusion within the Regulations of that part of industry dealing with the melting and casting of metal for the production of non-ferrous ingots, billets, slabs and other similar non-ferrous products.

Copies of the draft Regulations may be obtained from the Ministry of Labour, Safety, Health, and Welfare Department (W.5), 19, St. James's Square, London, S.W.1. Any observations on these draft regulations should be made in writing to the Ministry of Labour, 19, St. James's Square, S.W.1, by August 31.

European Foundry Apprentice Competition

In the Fourth European Foundry Apprentice Competition, held in Munich, Germany, from May 15 to 19, apprentices from Germany took the first three individual places; French entrants the next three; Mr. E. R. Y. White, a British ironfounding apprentice from Le Grand Western Foundries, Limited, Southall, was seventh; an Austrian, eighth, a Dane, ninth, and the other two apprentices of the team from the United Kingdom, Mr. M. J. Rosendale (K. & L. Steelfounders & Engineers, Limited, Letchworth) and Mr. A. Morris (Wallsend Slipway & Engineering Company, Limited, ironfounders, etc., of Wallsend-on-Tyne) were tenth and eleventh. There were 16 individual competitors in all, of these Mr. White came first in the calculations paper. Among the competing teams, the team from Germany was first, that from France, second, and from the United Kingdom, third. (Full details of the competition will be published in a future issue of the JOURNAL.)

Safeguarding Health in Small Firms

Improving the health and safety of employees was a worthwhile thing, declared Mr. John Hare, Minister of Labour, opening the Poyle Industrial Health Clinic, at Colnbrook, Slough, last week. He said he would like to see many more such schemes set up in all parts of the country, but the trouble was these things cost money. For the larger firm to provide adequate medical supervision for its personnel should present no great problems, but for the small firm it was not so easy. Clearly it would be impossible for every firm in the country to provide its own industrial health service; it would be a wasteful way of using resources and the cost would be enormous. "The obvious answer for the small firm lies in the group scheme," he said and added that every new clinic, every new group scheme, that was opened set an example for others to follow.

News in Brief

INTERNATIONAL COMPUTERS & TABULATORS, LIMITED, has taken over the premises of Glover & Main, Limited, at Thornton Road, Croydon.

SPARTAN STEEL & ALLOYS, LIMITED, stainless-steel manufacturers, have opened a sales office in Sheffield at 534, Attercliffe Road, Sheffield 9. (Telephone: 49551/2.)

A NATION-WIDE SALES PROMOTION TOUR for Sofono electrical appliances, manufactured by Federated Foundries, Limited, will begin at the Bedford Hotel, Brighton, on May 29 and finish in Scotland on June 13.

ORDERS FROM GERMANY, France, and Denmark have been obtained by Thomas White & Sons, Limited, engineers, Paisley, who are exhibiting in the wood-working machinery section of the 1961 Hanover Industries Fair.

QUALCAST, LIMITED, celebrated the production of their eight-millionth lawn-mower by presenting a 14-in. motor-mower to the National Playing Fields Association. Nine similar machines are to be presented by the firm to the Association.

ORDERS RECEIVED by the Leyland Motors group during the week ending May 5 totalled over £2,500,000. Including orders placed with the subsidiaries, Albion Motors, Limited, and Scammell Lorries, Limited, the figure was well over £3,000,000.

BRITISH INDICATORS (SALES), LIMITED, St. Albans, Herts., have been granted a licence by the British Standards Institution to apply the Kite-mark to their range of dial gauges for linear measurement manufactured in accordance with B.S.907.

WILSON SPORTING GOODS COMPANY, of Chicago, are to open premises in the new industrial estate at Irvine, Ayrshire, producing golf clubs to American design. The factory will be a 50,000 sq. ft. unit capable of considerable expansion and will cost £150,000.

MARKHAM & COMPANY, LIMITED, engineers, Chesterfield, are to instal new machinery at the Kariba Dam at a cost of over £100,000. The firm originally built the giant turbines for the project. A water turbine for a power-station is also being built by the company in New Zealand.

CROFTS (ENGINEERS), LIMITED, power transmission engineers, Thornbury, Bradford, 3, announce the appointment of Mr. John R. Mitchell as technical representative for the Sheffield area. His office is at 12, Collegiate Crescent, Sheffield 10. (Telephone: 65792.)

CLAYTON EQUIPMENT COMPANY, LIMITED, Hatton, near Derby, a member of the International Combustion (Holding) Limited group, has received an order worth about £5,000,000 from the British Transport Commission for 88 diesel-electric locomotives for the Scottish Region.

LEITH DOCK COMMISSIONERS have accepted an offer by Babcock & Wilcox, Limited, to supply and erect two 10-ton capacity travelling electric cranes for £78,078. They will be manufactured at the Dalmuir works of the company and the first will be ready for use in 15 months.

Mr. T. O. SEWELL, managing director, Yale & Towne Manufacturing Company, Limited, Willenhall, Staffordshire, has presented gold watches to 12 employees with 25 years' service with the firm. This brings the total of long-service awards made by the firm since the start of the scheme to 631, of whom six have 50 years' service each.

THE HENRY MORLEY LECTURE on "Bauxite and Aluminium with Particular Reference to the Commonwealth" is to be given by Mr. Wilfred Brining, F.C.A., at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, this evening commencing 5.15 p.m. Admission is by ticket only.

THOMAS SMITH & SONS (RODLEY) LIMITED, who only five months ago appointed agents in Bahrein, have received an order worth £58,000 for six mobile cranes for the Port Authority of the island in the Persian Gulf. The first of the cranes, with pneumatic tyres and a lifting capacity of six tons, will be delivered in January of next year.

AN ORDER for a cargo motorship, of about 8,250 tons d.w., has been placed with the Burntisland Shipbuilding Company, Limited, Fife, by the Bristol City Line of Steamships. Along with the machinery, a Sulzer-type diesel engine to be built by Hawthorn Leslie (Engineers), Limited, Newcastle, the contract is worth an estimated £800,000.

ANOTHER STAGE HAS BEEN REACHED in the moves to establish a large modern steel-rolling mill at Worksop. The county director of planning has recommended the Borough Council to give conditional consent to an outline application from Arthur Lee & Sons, Limited, for the mill to produce steel billets, slabs, rods and bars at Clayland. The Council has agreed.

RANSOMES SIMS & JEFFERIES, LIMITED, Ipswich, have added a 56-year-old Ransomes motor-mower to their museum of veteran machines. It is a 24-in. mower powered with the original Orwell 2¾ h.p. side-valve engine. An interesting feature is the double-angle divided cutting cylinder, a type patented by the company in 1899. In 1905 the machine now acquired sold for £75.

TWO OF SHEFFIELD'S OLDEST WATER-WHEELS, which for the past 40 years have stood unused at the works of John Wood & Sons (Wisewood), Limited, steel manufacturers, Sheffield, are to be demolished. The larger wheel, 20-ft. dia. and containing metal weighing 15 tons, drove a tilt or tail hammer; the smaller wheel drove the blowers and developed a pressure of about 4 lb. per sq. in.

BY ORDERS IN COUNCIL the Queen has approved the foundation of the new Chair of Nuclear Engineering at the University of Glasgow. A new degree, that of Bachelor of Technological Science, has been instituted in association with the Royal College of Science and Technology, and will offer a three-year course for the ordinary degree and a four-year course for the degree with honours.

HEDON CHEMICALS, LIMITED, have recently completed substantial extensions to their vinyl acetate plant at Salt End, near Hull. The plant, on a 100-acre site, was originally commissioned in 1956 and the recent expansion will increase productive capacity by approximately 60 per cent. The company is jointly owned by the Distillers Company, Limited, and Shawinigan Chemicals, Limited, of Canada.

WESTINGHOUSE BRAKE & SIGNAL COMPANY, LIMITED, have received a contract from the North Eastern Region of British Railways to bring the 31½ miles of route between York and Beverley under centralized traffic control at York. The scheme will mean the abolition of 20 of the 23 manually-operated level crossings and will be one of the largest centralized traffic control installations in the country.

A "COME TO SHEFFIELD" PLAN for American tourists is being backed by Sheffield Junior Chamber of Commerce and Sheffield United Tours, Limited. The scheme is to provide Americans in this country with a 24-hr. stay in the city with visits to factories and steel plants. British Railways have been asked if they will provide "tourist only" cars on certain afternoon trains from London. An all-in charge of 12 guineas has been suggested.

A DELEGATION OF THREE ENGINEERS from the State Scientific & Technical Committee of the USSR Council of Ministers visited the Hartlepool Works of the Richardsons Westgarth group recently. The visit was arranged as a return one paid to Moscow by a member of Richardsons Westgarth last December. A further visit by Russian engineers and foreign trade representatives to the British company is being arranged to take place later in the year.

RADIATION PARKRAY, LIMITED, Belper (Park Foundry), have selected two young employees to attend a 26-day course at the Outward Bound Sea School at Aberdovey, Merionethshire. They are 18-year-old Frederick Keith Wright, a trainee draughtsman, and 17-year-old Michael Clarence Fearn, a pattern moulder, who have been selected for conscientious work and good behaviour. The foundry is paying expenses of the school as well as the normal wages.

WEST INSTRUMENT, LIMITED, temperature-control-instrument manufacturers, Brighton, have concluded agreements whereby the British firm will act as agents in this country for two US companies. The American companies are Radiation Electronics Corporation, a division of the Comptometer Corporation and manufacturers of radiation thermometers and infra-red scanning systems, and the RdF Corporation, which makes resistance thermometers and allied equipment.

THE ENGINEERING WORKS of Ruston & Hornsby, Limited, Lincoln, were visited during the week ending May 13 by three leading business men from Korea—Mr. Sung Nack Sang, Mr. S. H. Lee and Mr. C. C. Lee. During their tour they visited the firm's research centre among other departments. The visit to the works coincided with the appointment of a new Ruston & Hornsby group of distributors in Seoul, where the company feel there is a large market potential.

ALD. H. STANLEY formally accepted on May 11 a 1923 Stoneleigh car which was handed over by Mr. W. H. Lindsey, technical director (power) of Bristol Siddeley Engines, Limited, as a gift to the Herbert Art Gallery and Museum at Coventry. The car, the first automobile to be driven up Snowdon is a rare model as it was produced for only a year by the Stoneleigh Company which was then a subsidiary of Armstrong Siddeley Motors, Limited. It is to be added to Coventry's collection of veteran vehicles.

SHEFFIELD WILL BE REPRESENTED by three apprentices at the International Apprentice Competition in West Germany in July. The three who won places from 428 entrants all over Britain are George Butler, 19-year-old apprentice turner at Davy & United Engineering Company, Limited, Darnall, Sheffield; 17-year-old Ronald Taylor, an apprentice moulder at Newton Chambers & Company, Limited, Chapeltown, Sheffield; and 18-year-old John E. Frost, apprentice fitter, Newton Chambers & Company. They took part in special eliminating contests organised by the City and Guilds of London Institute.

Mr. GILBERT A. HUNT, managing director of Massey-Ferguson (United Kingdom), Limited, drove off the assembly line on May 12, the 250,000th Massey-Ferguson 35 tractor to be made at the company's Coventry factory. The model was introduced in 1956 to succeed the T.E. 20 model. It has been exported to 192 territories and some 70 per cent. have been exported. It was stated on May 12 that production for March this year was 7,389 units—the highest for any month since the factory opened. Production of all models in the six months ended April 30 was 1.4 higher than in the corresponding period last year.

THE BRITISH INSTITUTE OF MANAGEMENT are holding a communication conference at the Connaught Rooms, London, W.C.2, to-day (May 25). Lord Beveridge will open the conference, and papers will be presented by Sir Josiah Eccles, C.B.E., deputy chairman of the Electricity Council, on "Communication and the Responsibility of the Chief Executive," Mr. Victor Feather, C.B.E., assistant secretary, Trades Union Congress, on "Communication and the Trade Union," Mr. Alvin C. Leyton, Head of Liberal Studies, Northampton College of Advanced Technology, on "Communication—the individual problem" and a BIM communication project will be described by Mr. E. Moonman.

AT THE ANNUAL GENERAL MEETING of the National Brassfounding Association held in Birmingham it was reported that trade had remained at a high level during the year. A high proportion of it has been for the supply of fittings for the building and plumbing trade, and there had been no falling off. Some difficulties in export markets had resulted from the development of local manufacture in the Commonwealth and from competition at questionable prices from other quarters. The membership is 180. An increase of £1,000 in income was due to increased subscriptions. A £1,000 legacy from the late C. Y. Hopkins of James Cartland & Son, Limited, had been left for the "Brass Founders' Benefit Fund" and ways for using it were being considered.

SIR DAVID ECCLES, Minister of Education, formally opened the new Lanchester College of Technology at Coventry on May 12. The College commemorates in its title the late Dr. F. W. Lanchester who died in 1946 after an outstanding career as an engineer. Advanced education in engineering, science, management studies and business is the function of the Lanchester College of which Dr. A. J. Richmond is principal. It will not be completed until 1964 but already has 5,000 students. The teaching block has been built at a cost of £267,000 and at present contains the administrative and communal facilities which, in three years' time, will move to new blocks. When the scheme is completed the total cost will reach about £1,250,000 with a further £1,000,000 for furniture and equipment. It is hoped that two halls of residence will shortly be available for full-time and sandwich-course students.

Obituary

Mr. R. R. MARRIOTT, works manager at Parker Foundry (1929), Limited, Derby, for the past five years has died.

Mr. T. DAVIDSON who four months ago retired as mills manager and chief roll designer with the Lanarkshire Steel Company, Limited, has died at his home in Motherwell. He was with the Colville group for 35 years. Mr. Davidson was a member of the rolls design committee (British Iron and Steel Research Association), and was chairman of the committee in 1959. He was also a member of the Iron and Steel Institute and of the West of Scotland Iron and Steel Institute.

Translation Service

From amongst the most recently published lists of translations available from the Iron & Steel Institute (4, Grosvenor Gardens, London, S.W.1), the following have been selected as being of interest to founders. The price quoted is that for single copies, postage extra, there being reductions for quantities ordered. Readers writing for translations, or for further information, should mention this JOURNAL when doing so.

BISI 1972 QUANTITATIVE X-RAY FLUORESCENCE ANALYSIS OF MULTI-COMPONENT SYSTEMS. (From German.) Preis, H., & A. Esenwein. *Schweizer Archiv*, 1959, NOV., 415-418. (£2 10s.)

BISI 1999 ELECTRICAL WEIGHING MACHINES IN STEELWORKS. (From German.) Oemigk, J. *Stahl Eisen*, 1960, *80*, Oct. 13, 1411-14. (£3 5s.) Main components of electric weighing machines; load cells with extension strain gauges acting as load receivers and compensators acting as load indicators. Examples of installations carried out. Bunker weighers, track and platform weighbridges. (Author's summary.)

BISI 2092 CLEANING OF FUME FROM ELECTRIC-ARC FURNACES. (From French.) Septier, L. *Centre Doc. Sider.* (Paris), 1958, *15*, (7), 1479-86. (£2.) Two methods of fume collection are compared. Methods of dust removal by multi-cyclone separators, water scrubbers, dry filters, venturi scrubbers, and electrostatic filters are outlined. Special attention is paid to the problem of the fumes produced during O$_2$ injection. Consumption of water and electrical power is discussed. (*JISI* abstract, 1960, Feb., 256a.)

BISI 2001 BREAKAGES OF CRANE HOOKS AND LADLE YOKES AND HOW TO AVOID THEM. (From German.) Will, G. *Stahl Eisen*, 1954, *74*, Aug. 12, 1062-1069. (£5 10s.) Some typical fractures of crane hooks and ladle hangers, observed in recent times, are described. The fractures were due to ageing-susceptible materials, reduced cross-sections, or to incorrect welding and heat-treatment. The results of temperature measurements on ladle hangers, with and without radiation protection, have proved the high efficiency of a radiation shield, without which the inner faces of the hangers can reach a critical temperature of 150-250 deg. C. The results of American stress and temperature measurements on heavy hangers are reported. In some circumstances temperatures of up to 550 deg. C. are to be expected on the unprotected surfaces of the hook shanks. On the basis of the present experiments, rules are laid down for choosing materials, design, manufacture, treatment, and supervision of hooks and hangers. (Abstract *JISI*, 1955, Feb., 197.)

BISI 2127 EFFECT OF PHOSPHORUS ON SOME PROPERTIES OF AUSTENITIC NICKEL-CHROMIUM STEEL. Pridantsev, M. V., and D. A. Litvinenko. 386-397.

New translations in course of preparation include:—

BISI 2117 MELTING, CASTING AND HEAT-TREATMENT OF MOLYBDENUM- AND COPPER-CONTAINING FULLY-AUSTENITIC CAST NICKEL/IRON/CHROMIUM ALLOYS. (From German.) Roesch, K., and K. H. Schmitz. *Giesserei Tech. Wiss. Beihefte* (Düsseldorf), 1961, *13*, Jan., 43-55.

BISI 2131 THICKNESS OF THE ZINC COATING AND THE CORROSION RESISTANCE OF HOT-DIP GALVANIZED PARTS. (From German.) Haarmann, R. *Metalloberfläche*, 1959, *13*, Nov., 342-345.

BISI 2133 APPLICATION OF X-RAY SPECTRO-ANALYSIS IN THE IRON AND STEEL INDUSTRY. (From German.) Kopineck, H-J., & P. Schmitt. *Arch. Eisenhütt.*, 1961, *32*, 19-29.

BISI 2134 INVESTIGATION OF ANTIQUE IRON COMPONENTS FROM COLOGNE CATHEDRAL. (From German.) Daeves, K. *Stahl Eisen*, 1940, *60*, Mar. 21, 245-252.

BISI 2140 NALCOMISING: A PROCESS FOR HARDENING STAINLESS STEELS. (From Italian.) Anon. *Macchine*, 1958, *13*, Dec., 1197-99.

Other People's Translations

For the following translations enquiries should be made to the organizations denoted by the initials CB, SLA, etc. Addresses are given at the end of the list.

CB CONTINUOUS CASTING OF STEEL. Boichenko, M. S., V. S. Rutes, and N. A. Nikolaev. Trans. of unidentified Russian mono. 1960. ($10.00.)

SLA 60-18826 AUTOMATIC CONTROL OF VARIOUS OPERATIONS IN THE IRON AND STEEL INDUSTRY. Chelyustkin, A. B., and B. A. Levitanskii. Trans. of (Banyaszati Lapok) (Hungary) 1950, vol. 5, Dec., pp. 700-704. (Originally from *Prom. Energetika* (USSR), 1950, vol. 7, No. 3), mi $1.80, ph. $1.80.

DSIR M 2362 EFFECT OF SMALL ADDITIONS OF ZIRCONIUM, TITANIUM AND BORON ON THE STRUCTURE AND PROPERTIES OF SILICON IRON. Chursin, V. M., and A. Ya. Zavgorodnii. *Lit. Proizv*, 1959 (12), pp. 35-37.

DSIR M 2345 CASTING INTRICATE IRON COMPONENTS IN MULTI-SECTIONAL CHILL MOULDS. Gordon, G. I. *Lit. Proizv*, 1959 (12), pp. 7-8.

DSIR M 2346 NEW METHOD OF TRIMMING AND FETTLING CASTINGS. Kashanskii, M. S., et. al. *Lit. Proizv*, 1959 (12), pp. 8-9.

Organization Addresses:—

CB: Consultants Bureau, Inc., 227, West 17th Street, New York 11, N.Y., USA. SLA: SLA Translation Centre, John Crerar Library, 86, East Randolph Street, Chicago 1, Illinois, USA. DSIR: Department of Scientific and Industrial Research, 20, Chester Terrace, London, N.W.1.

Tollemache Translations

Translations available or in preparation by Mr. M. de O. Tollemache, The Old Rectory, Lewknor, Oxon, include those listed below. Prices cover postage and packing in the United Kingdom, but postage is charged extra to foreign countries, in particular when sent by air mail. Prices will be quoted in US dollars on request. Where no price is shown, this will be advised on request, or in subsequent lists if the article is in course of preparation. Discounts are normally available on more than one copy.

Liteinoe Proizvodstvo

PRODUCTION OF COMPLICATED ALUMINIUM-ALLOY CASTINGS BY PRESSURE-DIE-CASTING. D. P. Tatanov and N. V. Kurakova. (1959, No. 8, p. 23.) MT 99. £1 10s.

Metallurg, from Vol. IV, 1959

DESIGN AND OPERATION OF AN 80-TON ELECTRIC FURNACE. L. S. Katsevich. (No. 9, pp. 17-19.) MT 36. £1 1s.

DEOXIDATION OF STEEL WITH SILICO/MANGANESE ALLOY. A. N. Vasil'ev and S. I. Bogachev. (No. 9, pp. 13-15.) MT 148.

Akademiya Nauk, SSSR, 1955

DEVELOPMENT AND ADOPTION OF A TECHNIQUE FOR CASTING HIGH-STRENGTH IRON (EXPERIENCE AT THE SUZRAN HYDROTURBINE WORKS). I. I. Petrov, pp. 192-199.

Slévarenstvi

OCCURRENCE OF BLOWHOLES IN CASTINGS AND MEASURES FOR THEIR ELIMINATION. J. Ornst. (1959, VII, No. 11, pp. 433-438.) MT 129. £6 10s.

Stal'

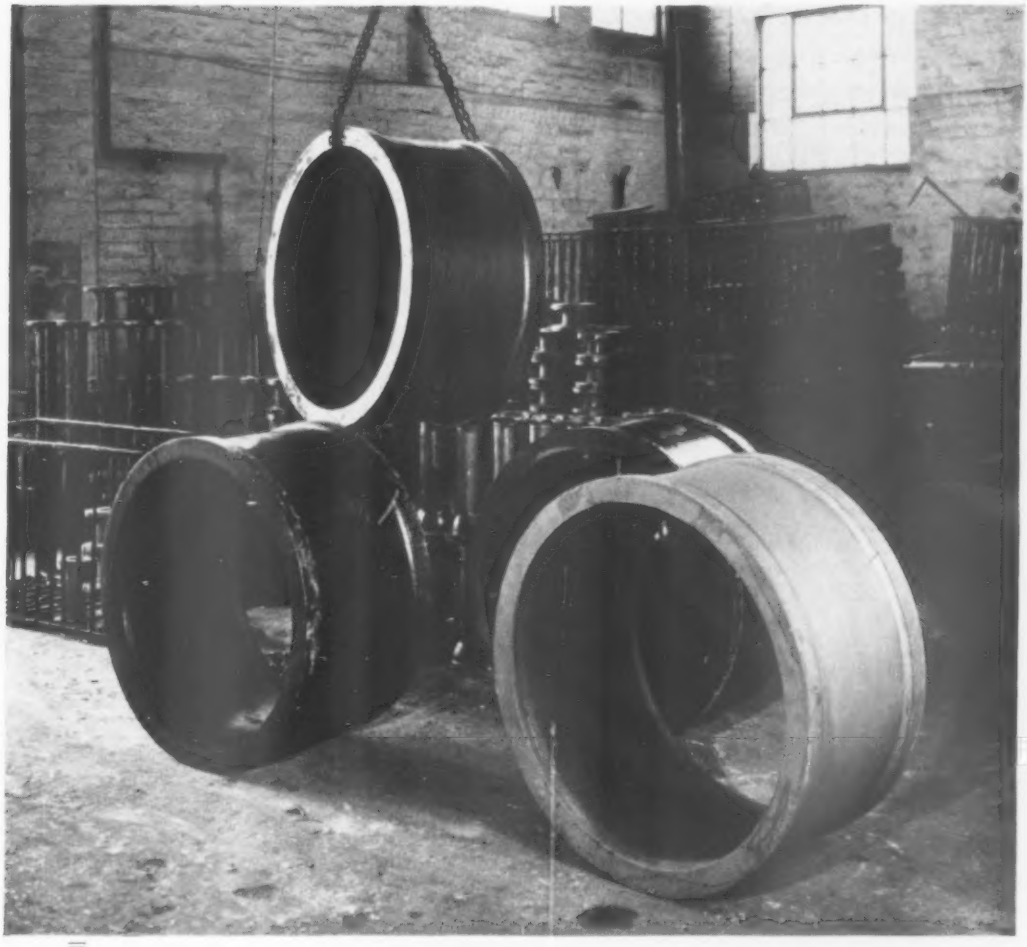
RELATIONSHIP BETWEEN INGOT-MOULD LIFE AND BOTTOM PLATE LIFE AND THEIR DESIGNS AND CONDITIONS OF SERVICE. D. M. Slonim. (1958, No. 10, pp. 894-899.) MT 45. £4 4s.

Heat-treatment of steel

A list of over 100 terms relating to heat-treatment of steel, has been published in four languages, German, English, French, and Russian, by the Deutscher Normenausschuss, FN Eisen und Stahl, Düsseldorf (22a), Breite str. 27, Postschliessfach 2507. Its reference is DIN 17 014, Beiblatt 2.

A new translation, now in preparation, which will be included in the BISI Translation Service if more requests are received, is E 2150 S.-G. IRON FOR MINING-MACHINE COMPONENTS. (From Russian.) Gorushkina, L. P., et al. *Lit. Proizv.*, 1960, (5), 42-3. In this instance the Institute asks those interested to state whether they would like to buy a copy (or copies) of the translation if included in the Service, and also would like to know whether a translation already exists.

A WORKSHOP at a Derby iron foundry was filled with poisonous fumes recently when overheating caused fumes from a liquid used in a degreasing process at the foundry to spread. Fireman wearing breathing apparatus had to break into and ventilate the workshop. No one was hurt.



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Raw Material Markets

Iron and Steel

Most of the ironfoundries closed for the Whitsun holiday and were able to carry out minor repairs to plant and cupolas. The suspension of deliveries caused little inconvenience to consumers whose plants generally were closed during the same period.

Business at the ironfoundries shows little change. The engineering and speciality foundries continue to obtain substantial outputs of high duty castings, and the machine-tool trade is also indenting for larger tonnages of castings. The light foundries are reasonably well employed. Those supplying to the domestic utensil trade remain moderately employed, although a seasonal demand has brought increased business from some sections of this trade. Most of the jobbing and textile foundries are fairly well employed, but could undertake more work.

All grades of pig-iron continue in plentiful supply, and the foundries are well covered for their needs. Present production is more than adequate and most producers could step up deliveries appreciably. Forward buying is very scarce, as the furnaces are able to give prompt deliveries against orders arising. The supply of basic pig-iron to the steelworks is adequate for current consumption and stock requirements, and makers could increase on present tonnages if demand warranted.

The foundries are taking up all arisings of heavy cast-iron and machinery scrap but these grades are none too plentiful. Foundry coke supplies are coming to hand satisfactorily and ganister, limestone, and firebricks are readily available.

The re-rollers are well provided with mild steel semis. Many of them still have reasonably good stocks and are unable to take up all the tonnages which home steelworks could supply. There is a steady demand for alloy and carbon steels. The re-rolling mills are obtaining fairly good outputs of small bars and light sections, and there has been some improvement in the call for strip and bright drawn bars. For reinforcing rods and bars the demand continues brisk. Generally, however, the overall demand for the products of the re-rollers continues below previous levels, and in consequence order-books are not now so heavy.

All arisings at the steelworks of suitable re-rolling defectives and crops are readily taken up.

Non-ferrous Metals

Copper has joined tin in being an active market on both sides of the Atlantic. Lead and zinc, however, continue dull with minor price fluctuations both in London and in New York. Tin is a strong and active market in Singapore, London and New York. In Singapore the price has reached the highest for 10 years, and although the rise has been sharp, the inevitable reaction has still left the quotation higher. In London the quotation is not far off £880 a ton, the level at which the buffer stock manager must sell metal from his stock. This has caused the market to go easier, a tendency strengthened by the reluctance to enter into commitments before the Whitsun holiday.

Nevertheless, the outlook is still bright. The possibility that the US might release 4,000 tons from its stocks has receded; production on a world basis is still declining and the estimated deficit this year between production and consumption is now being talked of as 15,000 tons to 30,000 tons. In New York, the market is good and the price is over $1.10 a pound.

Copper, too, has been active and the price in London has gone as high as £246 a ton. The day of cheap copper may now be over. Demand in London is good but supplies are sufficient, with the exception of electrolytic which is scarce. Continental demand is also strong, if somewhat intermittent. In the US, where the market has been steadily improving, custom smelters have raised their price by 1 cent a pound to 31 cents a pound and it is reported that July copper is being offered at 32 cents a pound. US producers followed custom smelters in their price rise and their quotations were adjusted to 31 cents a pound with the exception of Kennecott Copper Corporation, which continues to quote 30 cents a pound.

Zinc is a routine market in London with the price fluctuating narrowly around £81 a ton. In the US, the market has been something of a disappointment. Although consumption is picking up, production has also increased. No change is expected in the immediate future and the US price is unchanged at 11 cents a pound.

Lead is a dull market. In London the price has hardly been tested and is virtually static around £66-67 a ton. The same applies to the US where the price of high grade and special high grade metal has been reduced. The spot price, East St. Louis, for Prime Western, however, remains unchanged at 11½ cents a pound.

Metal Castings Merger

The Worcester firm of Metal Castings, Limited, has been merged with the multi-million dollar National Lead Company of America. The British firm will have the research facilities, technical knowledge and backing of Doehler-Jarvis of Toledo, Ohio, who as a division of the American company is one of the world leaders in pressure-die-casting.

In a statement, the chairman, Mr. F. W. McConnell, said that just over two years ago the firm faced a falling off in business. It was impossible to expand as there was no money available for vitally necessary research and development and they were unable to replace obsolete machinery. The firm has since been rorganized and improvement in the replacement of machinery and the provision of better working conditions has taken place.

Last Chance !

A few places are still available for IBF members, ladies and guests at the London branch golden jubilee celebrations to be held on Tuesday of next week at the Hurlingham Club, London. Following a cocktail reception (at 7 for 7.30 p.m.) and dinner, the arrangements will include light entertainment and dancing until 1 a.m. The ticket price of three guineas covers also table wines and liqueurs. Application for places should be made immediately to Mr. W. R. Buxton, Eyre Smelting Company, Limited, Tandem Works, Merton Abbey, London, S.W.19.

CFA Brochures

As announced in last week's JOURNAL, the Council of Ironfoundry Associations has published, in connection with Commonwealth Technical Training Week, a "give-away" folder "Cast Your Mind Forward" and a brochure "Careers in the Foundry Industry." In the announcement it was stated that bulk supplies, 1,000 copies, of the brochure could be obtained for £7 15s, whereas in fact this applies to the folder. "Careers in the Foundry Industry" brochures are available at 1s. per copy.

Company News

WILLIAM COOK & SONS (SHEFFIELD), LIMITED, general steelfounders, of Sheffield—Profits for the year rose to £131,051 (£106,064) and dividend has increased to 25 (22½) per cent.

HUNSLET (HOLDINGS) LIMITED, locomotive builders and makers, etc., of Leeds—The whole of the share capital of Materials Handling Equipment (Great Britain), Limited, of Maidenhead and London, has been acquired.

ARTHUR BALFOUR & COMPANY, LIMITED—Group net profit in 1960 expanded from £167,188 to £261,430, after heavier UK tax of £232,537 (£122,795). Total dividend is raised by 3 per cent. to 12 per cent. with a final of 9 per cent.

PLESSEY COMPANY, LIMITED, general engineers, of Ilford (Essex)—Interim payment is to be raised from 7 per cent. to 8½ per cent. on capital increased by a one-for-two rights issue against acquisition of the Garrard Engineering & Manufacturing Company, Limited.

BLAW KNOX, LIMITED, steel works and furnace equipment manufacturers, etc., of London, S.W.3—The company suffered a setback in 1960 and profits contracted to £106,926 (£203,877). By halving the final to 10 per cent. total dividend for the year is reduced to 20 (30) per cent.

ENGLISH STEEL CORPORATION, LIMITED—Group net profit for the year ended December 31, 1960, is £2,469,174 (£2,634,292) and dividend 12 (10) per cent. The chairman, Viscount Knollys, states that production is being maintained in the current year and on present prospects this should continue.

WILLIAM DOXFORD & SONS, LIMITED—Full details of the proposed merger with Sunderland Shipbuilding Dry Docks & Engineering Company, Limited, have been sent to members. The new company will be named the Doxford & Sunderland Shipbuilding & Engineering Company, Limited, and if the merger becomes fully effective will have an issued capital of £4,062,500.

WORTHINGTON-SIMPSON, LIMITED, manufacturers of pumps and pumping machinery, brass and iron castings, etc., of Newark (Nottinghamshire)—Orders have been coming in at a record level and the order-book is in a "very satisfactory state" says Mr. P. B. H. Brown, the chairman. At the same time he thinks future trading prospects must be looked at with certain reservations and fears that margins must shrink.

ROLLS-ROYCE, LIMITED—Consolidated revenue increased to £109,250,000 (£97,500,000) in 1960 and, with a final of 8½ per cent., the dividend is raised to 11 (10) per cent. Net profit is £3,158,636 (£2,636,469) after tax of £2,016,000 (£2,240,000). The board has under consideration the raising of additional capital by a further issue of debenture stock to be offered to holders of ordinary, workers (1955), and 4 per cent. debentures 1974-84.

PULSOMETER ENGINEERING COMPANY, LIMITED, pumping and filtering engineers and ironfounders, of London, W.C.1—In deciding to follow up the approaches made to them with a view to a merger, the directors had in mind that, apart from management and costs, one of the group's pressing problems is its cash position, states the chairman, Mr. H. T. Collinswood. A cash offer for both classes of capital, which has been made by Booker Bros. McConnell & Company, Limited, is recommended by the Pulsometer board.

ORTHOS LTD., MARKET HARBOROUGH, LEICESTERSHIRE. Telephone 3129

Pig-iron and Steel Production

Statistical Summary of February, 1961 Returns

The following particulars of pig-iron and steel produced in Great Britain are from statistics issued by the British Iron and Steel Federation. Table 1 summarizes activities during recent months. Table 2 gives production of steel ingots and castings in February. Table 3, weekly average production of finished steel in January. Table 4 gives the production of pig-iron and ferro-alloys in February, and furnaces in blast. (All figures are weekly averages in thousands of tons).

TABLE 1.—*Iron and Steel Index and General Summary of Pig-iron and Steel Production.*

Period.	B.o.T. Price Index, 1938 = 100.			Iron-ore output.	Imported ore used.	Coke sent to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy).			
	Iron and steel.	Coal.[1]	Basic materials[2]						Imports.[3]	Prod. ingots, castings.	Delivrs. finished steel.	Stocks.[4]
1959	340	486	477	286	244	210	242	208	7	388	291	2,244
1960	339	493	482	329	319	264	303	243	24	467	361	2,702
1960—Nov.[5]	339	525	474	344	337	279	315	266	20	505	370	2,686
Dec. ..	339	525	472	325	336	272	306	232	18	451	340	2,702
1961—Jan. ..	339	526	472	351	327	272	308	248	14	478	364	2,739
Feb. ..	339	526	476	354	325	265	302	254	11	485	365	2,773

TABLE 2.—*Average Weekly Production of Steel Ingots and Castings in February.*

District.	Open-hearth.		Bessemer and L.D.	Electric	All other.	Total.		Total ingots and castings.
	Acid.	Basic.				Ingots.	Steel for castings.	
Derbys, Leics, Notts, Northants, and Essex ..	—	4.8	14.3 (basic)	2.6	0.1	20.3	1.5	21.8
Lancs (excl. N.-W. Coast), Denbighs, Flints, and Ches	0.8	38.8	—	5.6	0.4	44.2	1.4	44.2
Yorkshire (excl. N.-E. Coast and Sheffield) ..								1.4
Lincolnshire	—	52.8	—	—	0.1	52.8	0.1	52.9
North-East Coast	0.9	92.7	—	1.8	0.5	93.7	2.2	95.9
Scotland	1.1	54.0	—	4.0	—	56.8	2.3	59.1
Staffs, Shrops, Worcs, and Warwicks ..	—	28.0	—	4.3	0.9	31.0	2.2	33.2
South Wales and Monmouthshire	2.3	86.4	18.8 (basic)	0.9	0.1	108.0	0.5	108.5
Sheffield (incl. small tonnage in Manchester) ..	8.1	39.4	—	14.8	0.4	60.7	2.0	62.7
North-West Coast	0.1	—	4.7 (acid)	0.8	—	5.4	0.2	5.6
Total	13.3	396.9	37.8	34.8	2.5	472.9	12.4	485.3
January, 1961	14.0	389.5	40.1	32.5	2.3	466.8	11.6	478.4
February, 1960	14.1	392.1	39.5	34.3	2.2	470.4	11.8	482.2

TABLE 3.—*Deliveries of New Non-alloy and Alloy Finished Steel.*

Product.	1959.	1960.	1960.		1961.
			Jan.	Dec.	Jan.
Non-alloy Steel:					
Ingots, blooms, billets, and slabs[6]	5.1	5.6	6.6	5.2	5.7
Heavy rails ..	6.8	8.7	6.9	8.6	8.9
Sleepers	0.6	0.8	0.5	1.0	0.2
Fish and soleplates	0.4	0.6	0.4	0.7	0.6
Plates, 3 mm. thick and over:	41.1	52.9	49.2	58.0	62.8
Other heavy prod.	41.2	53.1	55.6	51.4	58.9
Ferro-concrete bars	9.6	12.0	12.1	11.3	13.8
Wire rods	23.5	28.6	29.4	28.2	29.8
Arches, etc. ..	7.8	7.9	7.7	6.6	7.8
Other light sections	33.0	41.3	42.1	39.7	44.5
Bright steel bars ..	7.6	9.7	9.8	8.3	10.0
Hot-rolled strip ..	27.4	33.1	34.9	29.8	30.3
Cold-rolled strip ..	8.0	10.0	10.0	9.1	9.7
Sheets, incl. coated:	47.0	53.5	52.2	46.0	53.7
Tinplate	20.9	22.4	22.7	17.5	21.8
Blackplate ..	0.7	0.9	0.7	0.7	0.8
Tubes up to 16 in.	20.6	23.8	25.7	22.9	20.7
Tube fittings, etc.	0.4	0.4	0.4	0.4	0.4
Tyres, wheels, axles	2.4	2.4	2.7	2.3	2.0
Forgings (ex. drop)	2.1	2.2	2.1	2.5	2.4
Steel castings ..	3.6	4.3	4.2	4.6	4.5
Tool steel ..	0.2	0.2	0.3	0.3	0.2
Total	312.0	374.4	376.2	355.1	389.5
Alloy steel	18.2	22.5	23.1	22.3	23.1
Total deliveries from UK prod.[7] ..	330.2	396.9	399.3	377.4	412.6
Add: Imported finished steel ..	7.1	19.1	12.1	11.2	6.9
	337.3	416.0	411.4	388.6	419.5
Deduct: Intra-industry conversion[8] ..	47.6	56.4	58.2	49.3	56.8
Total new material ..	289.7	359.6	353.2	339.3	362.7

TABLE 4.—*Production of Pig-iron and Ferro-alloys.*

District.	Furnaces in blast.	Hematite.	Basic.	Foundry and forge.	Ferro-alloys.	Total.
Derbys, Leics, Notts, Northants, and Essex	20	—	27.9	20.5	—	48.4
Lancs (excl. N.-W. Coast), Denbighs, Flints, and Ches. ..	7	—	23.2	—	1.4	24.6
Yorkshire (excl. N.-E. Coast and Sheffield)	—	—	—	—	—	—
Lincolnshire	10	—	46.6	—	—	46.6
North-East Coast ..	18	2.6	63.9	—	1.3	67.8
Scotland	7	1.0	25.2	1.2	—	27.4
Staffs, Shrops, Worcs, and Warwicks ..	5	—	10.0	0.9	—	10.9
South Wales and Monmouthshire ..	10	3.5	50.2	—	—	53.7
Sheffield	2	—	3.5	—	—	3.5
North-West Coast ..	8	17.3	—	1.0	1.2	19.5
Total	87	24.4	250.5	23.6	3.9	302.4
January, 1961 ..	87	25.7	257.1	22.2	3.5	308.5
February, 1960 ..	83	21.7	249.0	28.7	2.1	301.5

[1] The index for coal is now based on prices ruling on the last day of each month.
[2] Used in non-food manufacturing industries.
[3] Weekly average of calendar month.
[4] Stocks, mainly ingots and semi-finished, at the end of the year and months shown.
[5] Five weeks, all tables.
[6] Other than for conversion into any other form of finished steel listed.
[7] Includes finished steel produced in the UK from imported ingots and semi-finished steel.
[8] Material for conversion into other products also listed in this table.

Baker Perkins Machinery at work . . . . . *at Peter Brotherhood Ltd.*

Peter Brotherhood Ltd. use this 'Cadet' Rotary Table Shot Blast Machine for a wide range of application at a high production rate. Note especially the control desk which includes signal lights, 24 volt current socket for inspection and ammeters indicating the shot output of the impeller. The wiring circuit is arranged for automatic operation to cut out human errors.

Baker Perkins Ltd.

Engineers

BEDEWELL DIVISION · HEBBURN-ON-TYNE · Co DURHAM

PHONE: JARROW 897124

HISTORICAL NOTE

Peter Brotherhood Ltd. were established in London in 1868. In 1907, the works was transferred to Peterborough, Northants. In their Foundry, they produce a wide range of general engineering castings for air and gas compressors, steam turbines, steam engines, refrigeration plant, water turbines, chemical filtration plants, textile machinery, brewery machinery, and many other applications

Current Prices of Iron, Steel, and Non-ferrous Metals

(Basis prices, delivered unless otherwise stated)

May 24, 1961

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2, 10-ton lots or over Middlesbrough, £21 17s. 0d.; Birmingham, £21 9s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.40 per cent. P 10-ton lots or over, £23 5s. 0d., delivered Birmingham £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d. South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.; North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

Hematite.—Si less than 2 per cent, S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over; N.-E. of England (local iron), £23 19s. 0d.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 9s. 0d.; Birmingham, £25 13s. 0d.; Wales (Welsh iron), £23 19s. 0d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire in 10-ton lots or over.

FERRO-ALLOYS

(per ton unless otherwise stated, delivered)

Ferro-Silicon (6-ton lots and over).—45 per cent. Si, £45 0s. 0d. to £48 0s. 0d., scale 15s. 0d. per unit, lumpy. 75 per cent. Si, £62 0s. 0d. to £66 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s.10d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 9s. 11d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 12s. 11d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy).—4/6 per cent. C, £81 10s. 0d. to £84 10s. 0d., basis 60 per cent. Cr scale 27s. 0d. to 28s. 6d. per unit; over 6 per cent. C, £79 0s. 0d. to £82 10s. 0d., basis 60 per cent. Cr, scale, 27s. 0d. to 28s. 6d. per unit; 2 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 1 per cent. C,* 1s. 8d. to 1s. 11½d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.10 per cent. C,* 1s. 9¾d to 2s. 0¾d. per lb. Cr; 0.06 per cent. C,* 1s. 11d. to 2s. 1d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free £275 0s. 0d.; 96/98 per cent., £285 0s.0d.

Ferro-columbium.—65/67 per cent. Cb + Ta, 19s. 0d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £58 10s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., 100 tons and over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 100 tons and over, £32 5s. 6d.; hard (0.41 to 0.60 per cent. C), 50 tons and over, £33 17s. 0d.; silico-manganese, 50 tons and over, £42 16s. 6d.; free-cutting, 50 tons and over, £35 4s. 6d. SIEMENS MARTIN ACID (50 tons and over): Up to 0.25 per cent. C, £40 11s. 0d.; silico-manganese, £43 4 s. 0d

Billets, Blooms, and Slabs for Forging and for Stamping (50 tons and over).—BASIC: Soft, up to 0.33 per cent. C, £37 0s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £38 2s. 6d.; acid, up to 0.25 per cent. C, £41 14s. 0d.

* Average 68-70 per cent.

FINISHED STEEL

Heavy Plates and Sections (50 tons and over).—Ship plate (N.-E. Coast), £40 7s. 0d.; boiler plates (N.-E. Coast), £42 17s. 0d.; floor plates (N.-E. Coast), £41 16s. 0d.; angles (N.-E. Coast), £38 1s. 6d.; joists (N.-E. Coast), £37 17s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 6d.; under 4 tons to 2 tons, £41 3s. 6d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3 mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £67 11s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £66 7s. 0d.; nickel-chrome, £97 1s. 0d.; nickel-chrome-molybdenum, £109 14s. 0d., in lots of 25 tons and over.

NON-FERROUS METALS

Copper.—Cash, £248 15s. 0d. to £249 0s. 0d.; three months, £249 10s. 0d. to £249 15s. 0d.; settlement, £249 0s. 0d.

Copper, Tubes, etc.—Solid-drawn tubes, 2s. 4¼d. per lb.; rods, 260s. 0d. per cwt. basis; 20 s.w.g., 295s. 0d. per cwt.

Tin.—Cash, £870 0s. 0d. to £871 0s. 0d.; three months £874 10s. 0d. to £875 0s. 0d.; settlement, £871 0s. 0d.

Lead (Refined Pig).—Second half May, £65 12s. 6d. to £65 15s. 0d.; second half August, £66 17s. 6d. to £67 0s. 0d.; settlement, £65 15s. 0d.

Zinc.—Second half May, £82 5s. 0d. to £82 7s. 6d.; second half August, £82 15s. 0d. to £82 17s. 6d.; settlement, £82 7s. 6d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £119 17s. 6d.; rolled zinc (boiler plates), all English destinations, £117 12s. 6d., zinc oxide (Red Seal); d/d buyers' premises, £97 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 11½d. per lb.; sheets to 10 w.g., 210s. 0d. per cwt.; wire, 2s. 9⅝d.; rolled metal, 210s. 0d. per cwt.

Brass (Brazing).—BS1400, B3, £187; B6, £232.

Brass (High Tensile).—BS1400, HTB1, £204; HTB2 £222; HTB3, £241.

Gunmetal.—BS1400, LG2, £234; LG3, £244; G1, ½%, £308; G1, 1%, £297.

Phosphor Bronze.—BS1400, PB1 (AID released), £326 BS1400, 90/10/1, £314.

Leaded Phosphor Bronze.—BS1400, LPB1, £256.

Phosphor Bronze Strip, etc.—Strip, 308s. 6d. per cwt. wire, 4s. 3½d. per lb.; rods, 3s. 6d.; tubes, 3s. 6d.; chil cast bars, solids 3s. 6d.; cored 3s. 7d. (CHARLES CLIFFORD LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 11¾d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 4¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 3¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 2½d. to 2s. 3d. per lb.; Antimony, English, 99 per cent., £230 0s. 0d. Quicksilver, ex-warehouse, £67 0s. 0d. Nickel, £600 0s. 0d. Aluminium, ingots, £186 0s. 0d.; aluminium bronze (BS1400), AB1, £258; AB2, £266.

TWIN 4 H.P. MOTOR TWO SPEED GRINDING MACHINE

Designed to enable the correct periphery cutting speed to be maintained, and allow each wheel to operate independently, thus one wheel only need be used or alternatively both wheels can be used at different speeds simultaneously.

Size of Grinding Wheels	—	20″ × 3″ × 7″
Speed of Motors	—	1400 r.p.m.
Speed of Spindles	—	1100 & 1250 r.p.m.
Distance between wheel centres	—	5′ 0″.
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SITUATIONS WANTED

PATTERN MAKER, 36, wood, metal, plastic and drawing office experience, requires position with prospects, preferably North of England. Box PM775, FOUNDRY TRADE JOURNAL.

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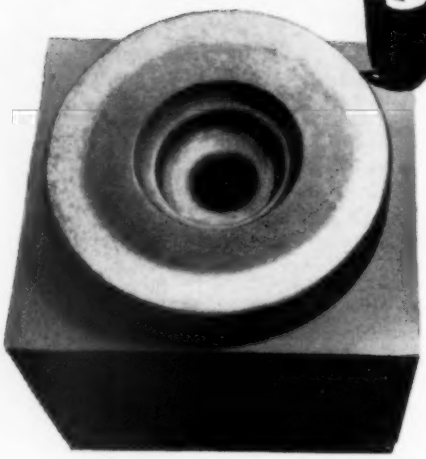

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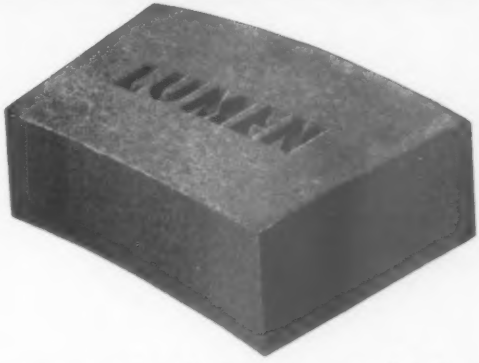

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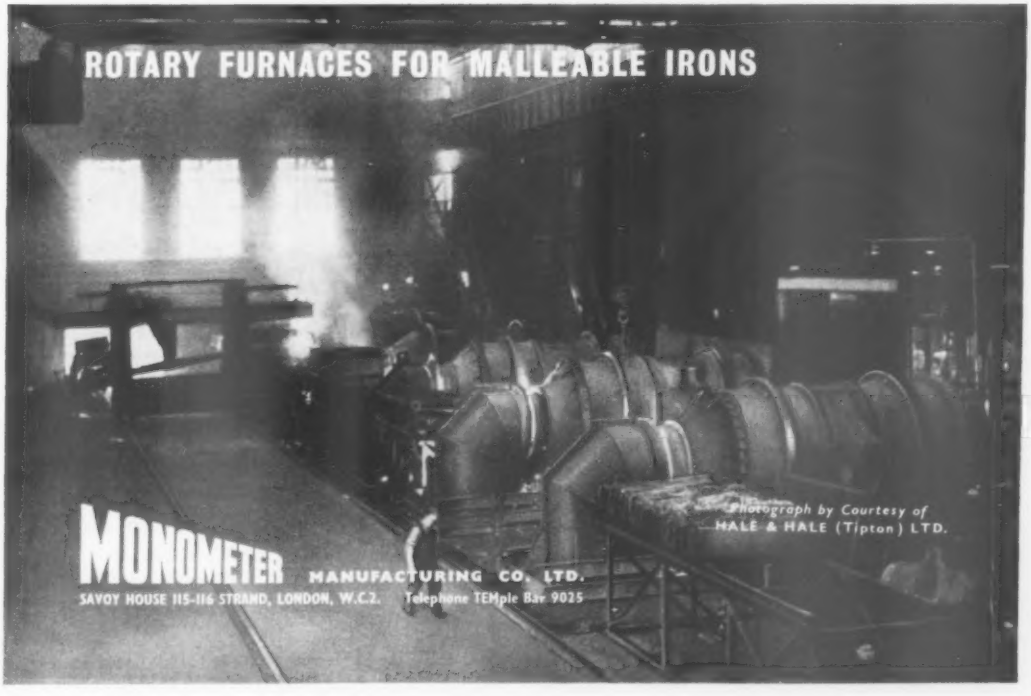
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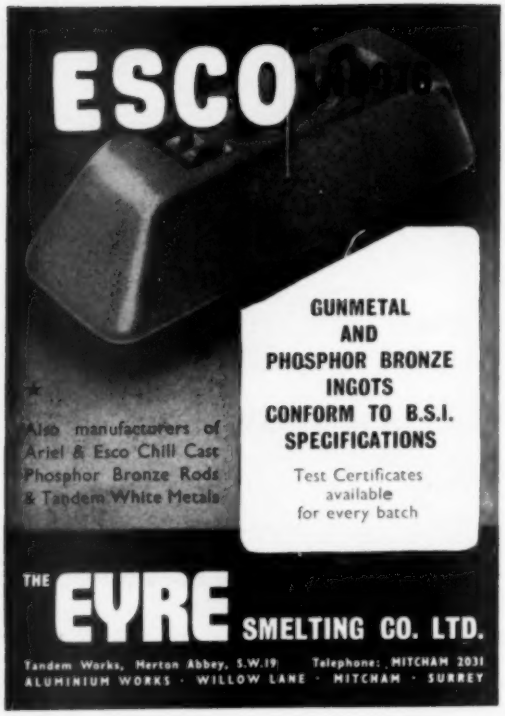

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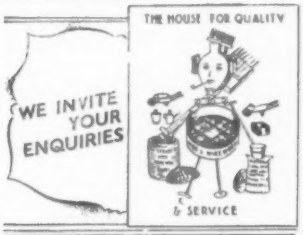

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	Page Nos.
A.E.I.-Birlec, Ltd.	—
A.E.I. Plastics (Aldridge) Ltd.	—
Acme Conveyors, Ltd.	11
Air Control Installations Ltd.	50
Albion Pulverising Co. Ltd.	—
Allan, John, & Co. (Glenpark), Ltd.	55
Alley Compressors, Ltd.	—
Amafond	—
Amber Oils, Ltd.	54
Anderson-Grice Co., Ltd.	—
Annealers, Ltd.	56
Armstrong Whitworth (M.I.), Ltd.	5
Ashworth Ross & Co., Ltd.	—
Aske, Wm., & Co., Ltd.	—
Ass. Lead Mfrs., Ltd.	54
Atlas Copco (G.B.), Ltd.	—
August's, Ltd.	44
Austin, E., & Sons, Ltd.	—
Badische Maschinenfabrik A.-G.	—
Bairds & Scottish Steel, Ltd.	42
Baker Perkins, Ltd.	681
Balbardie, Ltd.	—
Ballard, F. J., & Co., Ltd.	—
Ballinger, L. J. H., Ltd.	—
Beans Industries, Ltd.	34
Belliss & Morcom, Ltd.	—
Bennett, H. G., & Co. (Gloves), Ltd.	—
Berk, F. W., & Co., Ltd.	10
Bilston Stove & Steel Truck Co., Ltd.	—
Birkett, F. W., & Co., Ltd.	—
Birlec-Efco (Melting), Ltd.	—
Blackwell's Metallurgical Works, Ltd.	56
Bloomer, Holt, Ltd.	—
Boydell, E., & Co., Ltd.	—
Bradbury, John, & Co. (Stockport), Ltd.	50
Bradley & Foster, Ltd.	—
British Acheson Electrode, Ltd.	—
British Aero Components, Ltd.	—
British Cast Iron Research Association	—
British Electrical Repairs, Ltd.	—
British Foundry Units, Ltd.	—
British Industrial Sand Ltd.	—
British Iron & Steel Federation	—
British Monorail, Ltd.	—
British Moulding Machine Co., Ltd.	38 & 39
British Oxygen Co., Ltd.	—
British Ronceray, Ltd.	6
British Shotblast & Engineering Co., Ltd.	58
Broom & Wade, Ltd.	—
Buckland Sand & Silica Co., Ltd.	—
Burn, John, & Co. (B'ham), Ltd.	—
Burnand, W. E., & Son, Ltd.	—
Canning, W., & Co., Ltd.	—
Carborundum Co., Ltd.	—
Catalin, Ltd.	—
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Chapman & Smith, Ltd.	—
Chemicals & Feeds, Ltd.	—
Chetham Timber Co., Ltd.	—
Ciba (A.R.L.), Ltd.	—
City Casting & Metal Co. Ltd.	—
Clayton Crane & Hoist Co. Ltd.	—
Cleanair, Ltd.	—
Cohen, Geo. Sons & Co., Ltd.	—
Coleman-Wallwork Co. Ltd.	4
Combustion Chemicals, Ltd.	—
Consolidated Pneumatic Tool Co., Ltd.	53
Constructional Engineering Co., Ltd., The	17
Controlled Heat & Air, Ltd.	—
Conveyor & Shotblast, Ltd.	—
Cooke, Bailey, Ltd.	49
Coreshooters Sales, Ltd.	—
Corrosion, Ltd.	—
Cox & Danks, Ltd.	—
Crockett Lowe, Ltd.	—
Crooks, L. E.	—
Cumming, Wm., & Co., Ltd.	36
Dallow, Lambert & Co. Ltd.	—
Dickson, Roy Wilson, Ltd.	—
Distillers Co., Ltd., The	—
Dowler, H. J., Engineers & Pattern Makers, Ltd.	50
Dowson & Mason, Ltd.	—
Dunford & Elliott (Sheffield), Ltd.	—
Durrans, James & Sons Ltd.	61
Dustraction, Ltd.	56
Dustuctor Co., Ltd.	—
Dyson, J. & J., Ltd.	—
Electrical Development Association	—
Electrogenerators, Ltd.	—
Elliott Bros. (London) Ltd.	—
Elliott, E., Ltd.	—
Engineering Services (Manchester) Ltd.	—
Escol Products, Ltd.	—
Evans, James, & Co., Ltd.	59
Evans, Roy, M.I.B.F.	—
Evans, Stanley N., Ltd.	—
Eyre Smelting Co., Ltd.	58
F. & M. Supplies, Ltd.	677
Felco Hoists, Ltd.	26
Filter-Heat, Ltd.	—
Fischer, George, Ltd.	—
Fisher-Foundries, Ltd.	—
Fletcher Miller, Ltd.	36
Flextol Engineering Co., Ltd.	—
Fordath Engineering Co., Ltd.	2
Foseco International, Ltd.	15
Foseco Ltd.	—
Foundry Equipment, Ltd.	30 & 31
Foundry Mechanisations (Baillot), Ltd.	—
Foundry & Metallurgical Equipment Co., Ltd.	23
Foundry Plant & Machinery, Ltd.	1
Foundry Suppliers, Ltd.	—
Foxall, William, Ltd.	—
Foxboro Yoxall, Ltd.	14
Frankiss, R. J.(Patterns) Ltd.	—
Franklin Furnace, Ltd.	—
Fuel & Metallurgical Processes, Ltd.	—
Fullers' Earth Union, Ltd., The	18
G.W.B. Furnaces, Ltd.	—
Gas Council	62
General Electric Co., Ltd.	—
General Refractories, Ltd.	—
Gliksten, J., & Son, Ltd.	—
Goodyear Tyre & Rubber Co., Ltd.	—
Graphite Products	52
Great Lakes Carbon International, Ltd.	—
Green, E., & Son, Ltd.	—
Green, Geo., & Co.	—
Gregory, J. G., & Sons, Ltd.	—
Griffiths, A. E. (Smethwick), Ltd.	—
Guest, Keen Iron & Steel Works	—
Guyson Industrial Equipment Ltd.	—
Harborough Construction Co., Ltd.	29
Hargraves Bros. (Manchester), Ltd.	—
Harris & Pearson, Ltd.	57
Harvey & Longstaffe, Ltd.	—
Harvey, J. J. & Pressurecast, Ltd.	—
Hedin, Ltd.	—
Heneage Metals, Ltd.	—
Hepburn Conveyor Co., Ltd.	24
Heywood, S. H., & Co., Ltd.	—
High Speed Steel Alloys, Ltd.	—
Hills (West Bromwich), Ltd.	—
Holman Bros., Ltd.	—
Holmes, W. C., & Co., Ltd.	—
Holroyd & Hall, Ltd.	—
Hooker, W. J., Ltd.	—
Ilford, Ltd.	—
Incandescent Heat Co., Ltd.	32,33
Ingersoll-Rand Co., Ltd.	—
Interplas	51
J.S. Pattern Products, Ltd.	50
Jackman, J. W., & Co., Ltd.	—
Jacks, Wm., & Co., Ltd.	45
Keith Blackman, Ltd.	—
L.M.S. Products, Ltd.	—
Lafarge Aluminous Cement Co., Ltd.	—
Laidlaw, Drew & Co., Ltd.	—
Leicester Lovell & Co., Ltd.	—
Levy, B., & Co. (Patterns), Ltd.	50
Lones, Joseph, Laboratories	58
Lord, E. S., Ltd.	58
Luke & Spencer, Ltd.	28
Macnab & Co., Ltd.	—
Major, Robinson & Co., Ltd.	—
Mansfield Standard Sand Co., Ltd.	—
Marco Conveyor & Engineering Co., Ltd.	—
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Metalline Cement Co., The	—
Metals & Equipment (Wolverhampton), Ltd.	—
Midgley & Son, Ltd.	—
Midland Monolithic Furnace Lining Co., Ltd.	59
Mine Safety Appliances, Ltd.	—
Modern Furnaces & Stoves, Ltd.	9
Molineux Foundry Equipment, Ltd.	—
Monometer Manufacturing Co., Ltd.	57
Morganite Crucible Ltd.	21
Morris, B. O., Ltd.	19
Morris, H., Ltd.	—
Newton Collins, Ltd.	—
Nicholl & Wood, Ltd.	—
Norris Equipment & Construction, Ltd.	—
North Derbyshire Metal Products, Ltd.	—
Norton Grinding Wheel Company, Ltd.	—
Norton Industries Ltd.	45
Ormerod, R. E., Ltd.	59
Orthos, Ltd.	679
Palmer Aero Products, Ltd.	—
Parish, J., & Co., Ltd.	—
Park & Paterson, Ltd.	25
Parker Mitchell Engineering Co., Ltd.	—
Parmelee, (G.B.) Ltd.	—
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Platt Metals, Ltd.	—
Pneulec, Ltd.	7
Polygram Castings Co., Ltd.	20
Precision Presswork Co. Ltd.	—
Price, J. T., & Co., Ltd.	—
Production Chemicals (Rochdale), Ltd.	—
Purimachos, Ltd.	58
Rapid Magnetic, Ltd.	—
Reavell & Co., Ltd.	—
Refined Iron Co. (Darwen), Ltd.	—
Reid, Wm., & Co.	59
Richards Structural Steel Co., Ltd.	—
Richardson Eng'g., Ltd.	—
Richardsons Moss Litter Co., Ltd.	—
Richardsons, R. J. & Sons Ltd.	—
Ridsdale & Co., Ltd.	—
Robinson, Thos., & Son Ltd.	—
Robson Refractories, Ltd.	—
Roper, E. A., & Co., Ltd.	8
Rowland, F. E., & Co., Ltd.	—
Rubery Owen & Co., Ltd.	—
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Rustless Iron Co., Ltd.	—
Safety Products, Ltd.	—
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Smith, A. (S. & B. Foundry Sands), Ltd.	—
Smith, John (Keighley), Ltd.	—
Smiths Motor Accessories, Ltd.	—
Spencer & Halstead, Ltd.	27
Spermolin, Ltd.	—
Stansby, W., & Co., Ltd.	—
Stanton Ironworks Co., Ltd., The	16
Staveley Iron & Chemical Co., Ltd.	—
Steels Engineering Installations	—
Stein, John G., & Co., Ltd.	37
Stephens, Wm., & Sons, Ltd.	—
Sterling Foundry Specialties, Ltd.	12 & 13
Sternol, Ltd.	—
Suffolk Iron Foundry (1920), Ltd.	—
Sutcliffe Speakman, Ltd.	—
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Wai-Met Alloys Co.	35
Walker, I. & I., Ltd.	—
Walsh Bros.	—
Ward, Thos. W., Ltd.	3
Warner & Co., Ltd.	—
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West Midland Refining Co., Ltd.	—
Whitecross Co., Ltd.	—
Wild-Barfield Electric Furnaces, Ltd.	—
Wilkinson Rubber-Linatex Co., Ltd.	—
Wilson Crucible Co., Ltd.	59
Witham, L. A., & Co.	—
Woking Pattern Works, Ltd.	—
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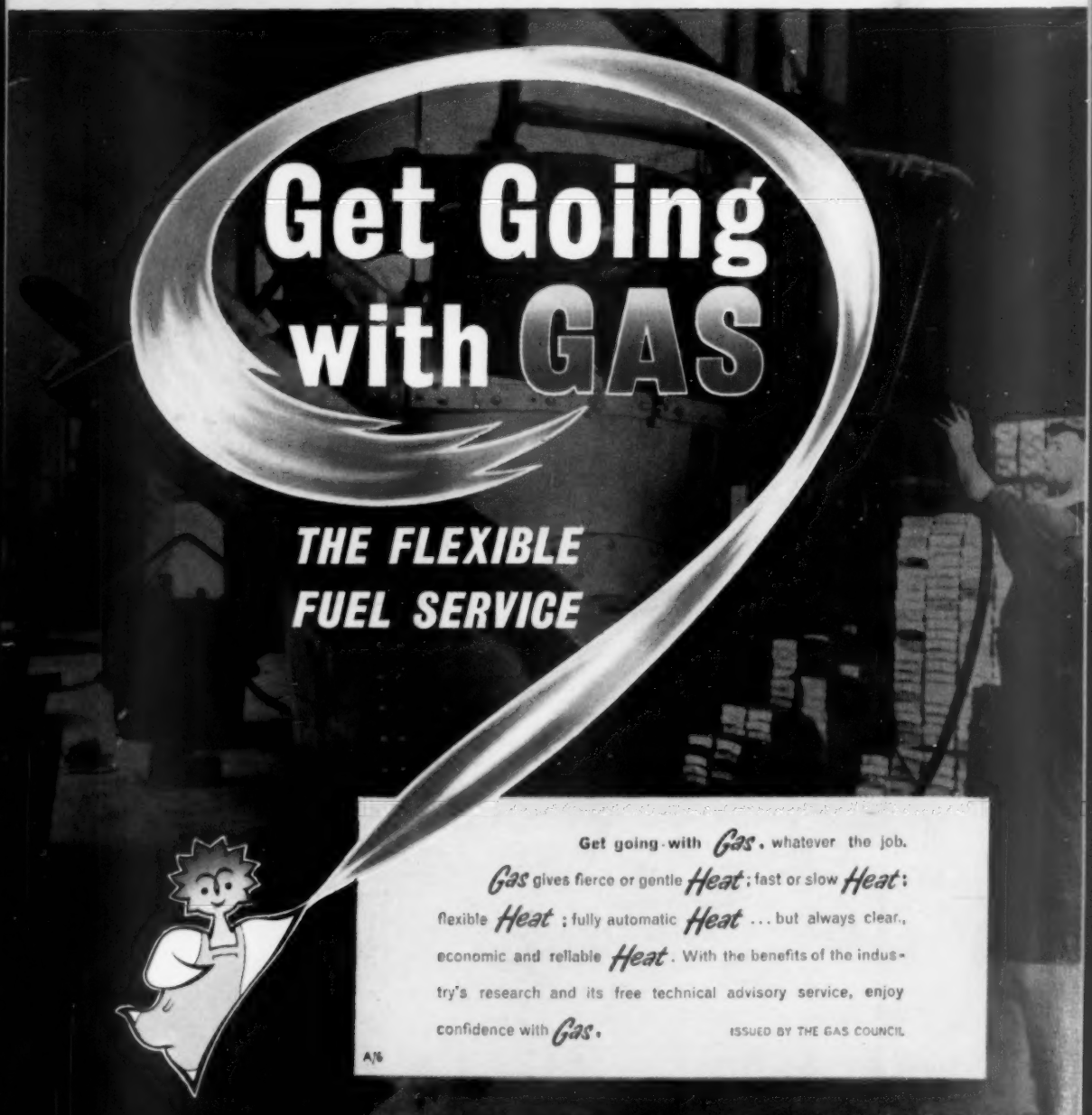
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